TM 9-1535

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORDNANCE MAINTENANCE

SIGHTS M4 AND M6

DEPARTMENT OF THE ARMY • *NOVEMBER 1952*

AGO 1498B—Nov

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This manual supersedes TM 9–1535, 15 February 1945

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United States Government Printing Office
Washington: 1952

AGO 1798B

This manual is correct to 1 July 1952.

DEPARTMENT OF THE ARMY

WASHINGTON 25, D. C., *13 November 1952*

TM 9–1535 is published for the information and guidance of all concerned.

[AG 472.82 (28 Aug 52)]

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The Adjutant General

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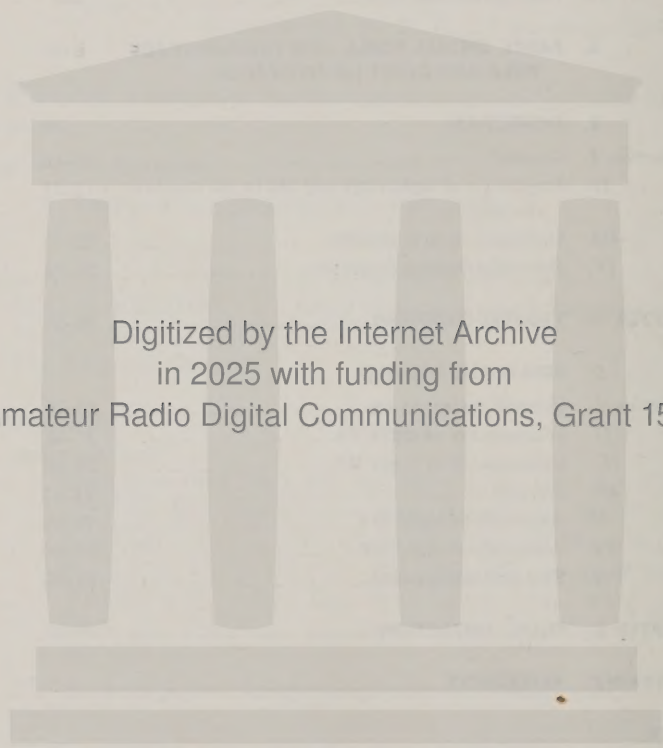

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This manual supersedes TM 9–1535, 15 February 1945.

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the information and guidance of personnel responsible for field and depot maintenance of sights M4 and M6. These instructions contain information on maintenance which is beyond the scope of tools, equipment, or supplies normally available to using organizations. This manual does not contain information which is intended primarily for the using organization, since such information is available to ordnance maintenance personnel in the pertinent operator's technical manual or field manuals.

b. This manual contains a description of and procedure for inspection, disassembly, repair, rebuild, and assembly of the sights M4 and M6.

c. The appendix contains a list of current references, including supply catalogs, technical manuals, and other available publications applicable to the sights.

d. Operation, lubrication, and all maintenance operations allocated to using organizations in performing maintenance work within their scope for these sights are contained in TM 9–575.

e. This manual differs from TM 9–1535, dated 15 February 1945, by adding and revising information on the following:

(1) Special tools and equipment.
(2) Collimator assembly, 7693650 for sight M4.
(3) Tests and accuracy of sights M4 and M6.
(4) Installing level vials.
(5) Inspection, assembly, and disassembly.

2. Field and Depot Maintenance Allocation

The publication of instructions for complete disassembly and rebuild is not to be construed as authority for the performance by

field maintenance units of those functions which are restricted to depots and arsenals. In general, the prescribed maintenance responsibilities will apply as reflected in the allocation of maintenance parts and tools listed in the appropriate columns of Department of the Army Supply Catalogs ORD 8 SNL F–148 and ORD 6 SNL F–272. Instructions for depot maintenance are to be used by maintenance companies in the field only when the tactical situation makes the repair functions imperative. Provisions of parts listed in the depot stock guide columns of ORD 8 SNL F–148 will be made to field maintenance only when the emergency nature of the maintenance to be performed has been certified by a responsible officer of the requisitioning organization.

3. Forms, Records, and Reports

a. General. Responsibility for the proper execution of forms, records, and reports rests upon the officers of all units maintaining this equipment. However, the value of accurate records must be fully appreciated by all persons responsible for their compilation, maintenance, and use. Records, reports, and authorized forms are normally utilized to indicate the type, quantity, and condition of matériel to be inspected, to be repaired, or to be used in repair. Properly executed forms convey authorization and serve as records for repair or replacement of matériel in the hands of troops and for delivery of matériel requiring further repair to ordnance shops in arsenals, depots, etc. The forms, records, and reports establish the work required, the progress of the work within the shops, and the status of the matériel upon completion of its repair.

b. Authorized Forms. The forms generally applicable to units maintaining this matériel are listed in the appendix. No forms other than those approved for the department of the Army will be used. For a current and complete listing of all forms, refer to current SR 310–20–6. For instructions on the use of these forms refer to FM 9–10. Additional forms applicable to the using personnel may be found in the operator's manual.

c. Field Reports of Accidents. The reports necessary to comply with the requirements of the Army safety program are prescribed in detail in the SR 385–10–40 series of special regulations. These reports are required whenever accidents involving injury to personnel or damage to matériel occur.

d. Report of Unsatisfactory Equipment or Materials. Any suggestions for improvement in design and maintenance of equipment, safety and efficiency of operation, or pertaining to the application of prescribed lubricants, and/or preserving materials, will be

reported through technical channels, as prescribed in SR 700–45–5, to the Chief of Ordnance, Department of the Army, Washington 25, D. C., ATTN: ORDFM, using DA Form 468, Unsatisfactory Equipment Report. Such suggestions are encouraged so that other organizations may benefit.

Note. Do not report all failures that occur. Report only REPEATED or RECURRENT failures or malfunction which indicate unsatisfactory design or material, however, reports will always be made in the event that exceptionally costly equipment is involved. See also SR 700–45–5 and printed instructions on DA Form 468.

Section II. DESCRIPTION AND DATA

4. Description

a. Sight M4. The sight M4 (fig. 1) is used for laying the following in azimuth and elevation: the 60-mm mortars M2 and M19; the 81-mm mortar M1 in the field and when mounted on the 81-mm mortar half-track carrier M4 and the tank recovery vehicle T14E1; and the 81-mm mortar M29. The sight includes a collimator, open sight, elevation and deflection mechanisms, and longitudinal and cross-level vials. The sight is supported by a bracket with a dovetailed base, which fits in a slot on the left side of the mortar mount yoke and latches in place. The sight is used for high angle fire. Instrument light M37 supplies illumination to the collimator reticle and to the level vials for night use. Carrying case M14 or M74 may be furnished in place of carrying case M81 shown in figure 1.

b. Sight M6. The sight M6 (fig. 2) is used for laying the following in azimuth and elevation: the 81-mm mortar M1 when mounted on the 81-mm mortar half-track carriers M4A1 and M21 and the tank recovery vehicle T14E1. The sight includes a collimator, elevation and azimuth mechanisms, and a longitudinal level vial. Since there is a cross-level on the mortar yoke, none is necessary on the sight. The mirror attached to the collimator assembly is for use in reciprocal laying. The sight is supported by a bracket with a dovetailed base, which fits in a slot on the left side of the yoke and latches in place. Instrument light M38 supplies illumination to the collimator reticle and the level vial for night use. Carrying case M46 (fig. 2) is furnished for stowing the sight when not in use.

5. Functional Description

a. Sight M4. The sight M4 is attached or detached from the mortar by means of the latch (fig. 3). The cross level (fig. 4),

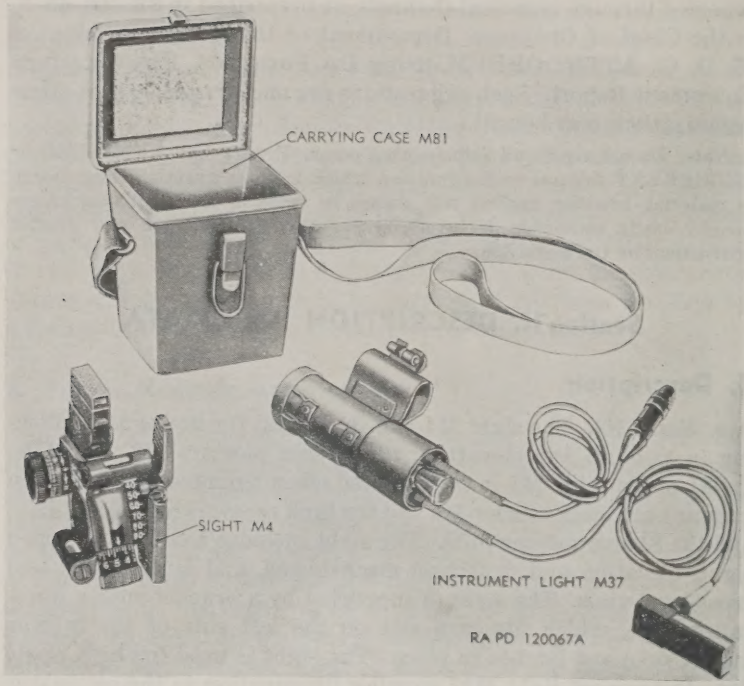

Figure 1. Sight M4 and equipment.

used in conjunction with the mortar cross leveling mechanism, centers a bubble when the mortar is cross leveled. The longitudinal level centers a bubble when the mortar elevating mechanism has elevated the mortar to the elevation indicated on the elevation scale and micrometer. Deflection is set on the deflection micrometer which moves the collimator. The collimator is pivoted so that it may be moved in elevation as required.

b. Sight M6. The sight M6 (figs. 5 and 6) has an adjustment mirror for reciprocal and rear aiming point laying. Its azimuth scale permits greater traverse than the deflection micrometer on sight M4. The azimuth mechanism can be disengaged by pushing forward on the micrometer knob (fig. 7). The cross level is on the mortar mount yoke and is not a part of the sight. In all other respects, the sight M6 is similar to sight M4 (*a* above) and is used in the same manner.

6. Differences between Sight M4 and Sight M6

a. Body. Sights M4 and M6 have different body sizes, the M4 being the smaller of the two. The bodies are also made from differ-

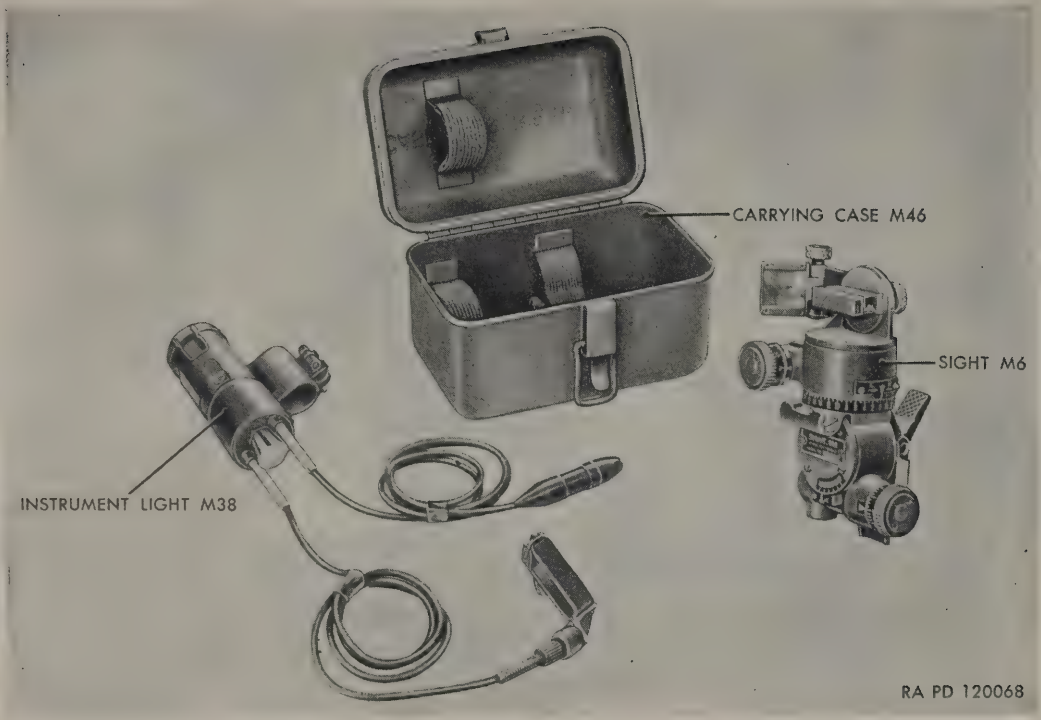

Figure 2. Sight M6 and equipment.

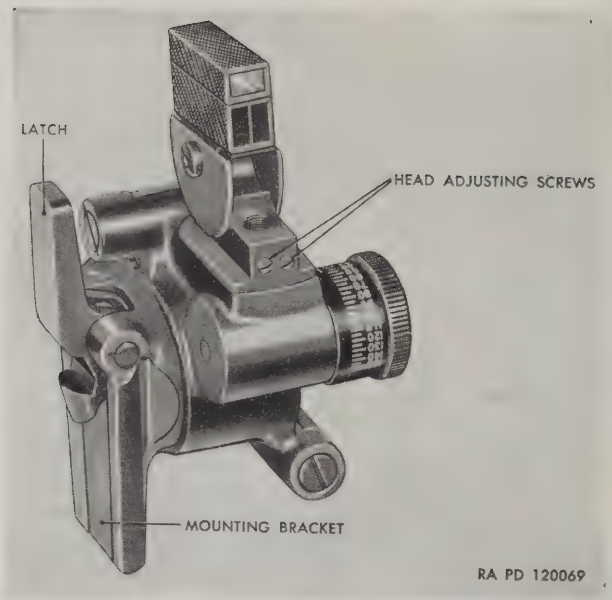

Figure 3. Sight M4—right front view.

ent materials. The sight M4 (fig. 4) body is made of aluminum-alloy and the sight M6 (fig. 6) body (housing) is made of bronze.

b. Elevation Scale and Micrometer. The elevation scale and micrometer are positioned differently on the two sights (figs. 4 and 6).

c. Deflection or Azimuth Scale and Micrometer. The sight M4 has a deflection micrometer (fig. 4), which is located on the left front side of the body. The sight M6 has an azimuth scale and azimuth micrometer (fig. 6). The word "deflection" for the sight M4 and "azimuth" for the sight M6 refers to the same type movement, movement in a horizontal plane. The azimuth micrometer, with its throw-out mechanism, is mounted on the left rear of the azimuth housing assembly (figs. 6 and 7).

d. Levels. The sight M4 has two levels; a cross level and a longitudinal level (fig. 4). Each level includes a vial. The sight M6 has only the longitudinal level (fig. 6). The mount on which the sight M6 is used has a cross level vial which eliminates the necessity for one on the sight.

e. Collimator. On the sight M4, the collimator is directly above the open sight, mounted on an adjustable bracket, which positions

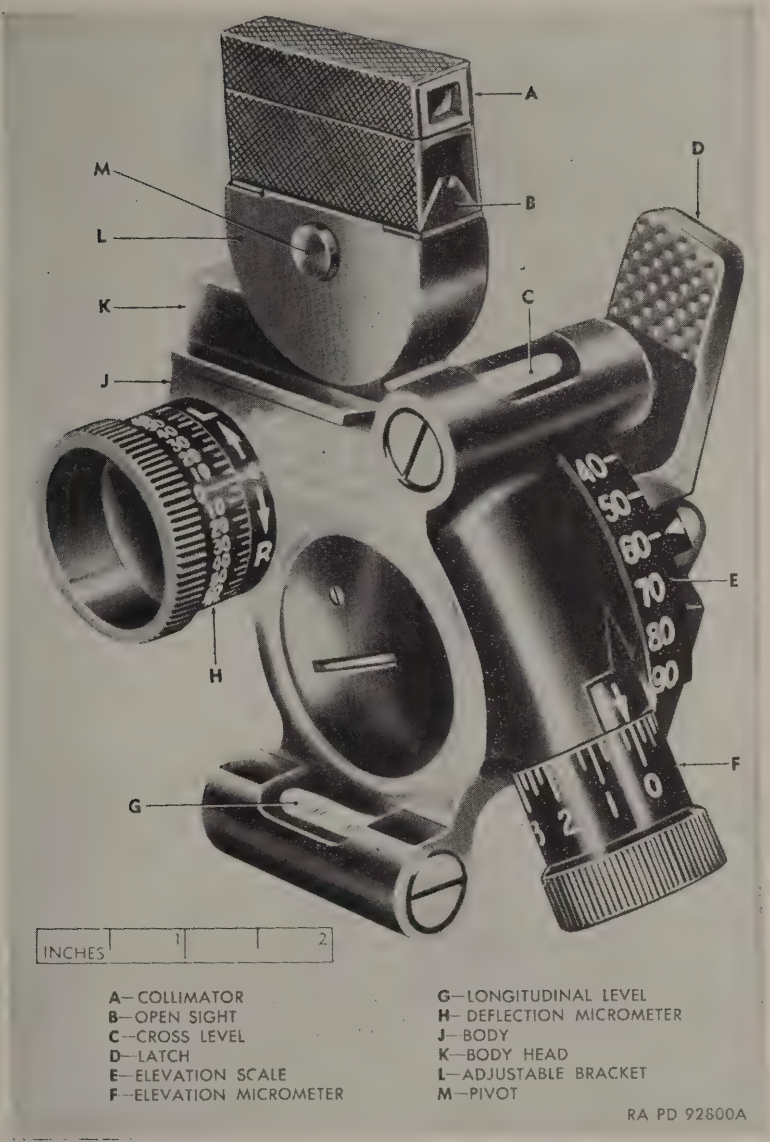

Figure 4. Sight M4—left rear view.

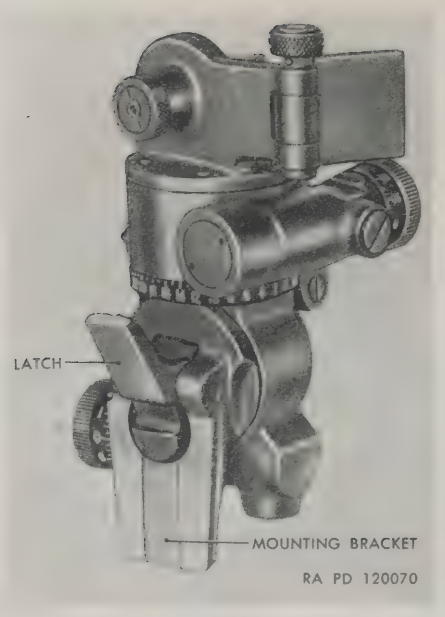

Figure 5. Sight M6—right front view.

it in the same vertical plane. The collimator assembly, C69998 is used on sight M4 of early manufacture. The collimator assembly, 7693650 is used on sight M4 of later manufacture. The collimator assembly, C69998 has a square-shaped eyepiece opening with a single, glass reticle, while the collimator assembly, 7693650 has a circular eyepiece opening with two reticles; one copper and one glass. The body of the collimator assembly, 7693650 is constructed of one piece of metal, while the corresponding part of the collimator assembly, C69998 is made up of several brazed pieces of metal. On the sight M6, the collimator (fig. 6) is on the left side of the open sight and is fastened to a rotating adapter, which positions it in a vertical plane. The collimator and open sight are in the same horizontal plane. The sight M6 has a mirror (fig. 6), which is not provided on the sight M4.

f. Elevation Mechanism. The sight M4 mechanism contains a torsion spring, which keeps the threads of the elevating worm in contact with the teeth on the elevation worm gear, thereby eliminating backlash between the gearing. The sight M6 has a worm and gear, in which backlash is taken up by the action of a plunger forcing the worm shaft to pivot in a ball and cap socket so that

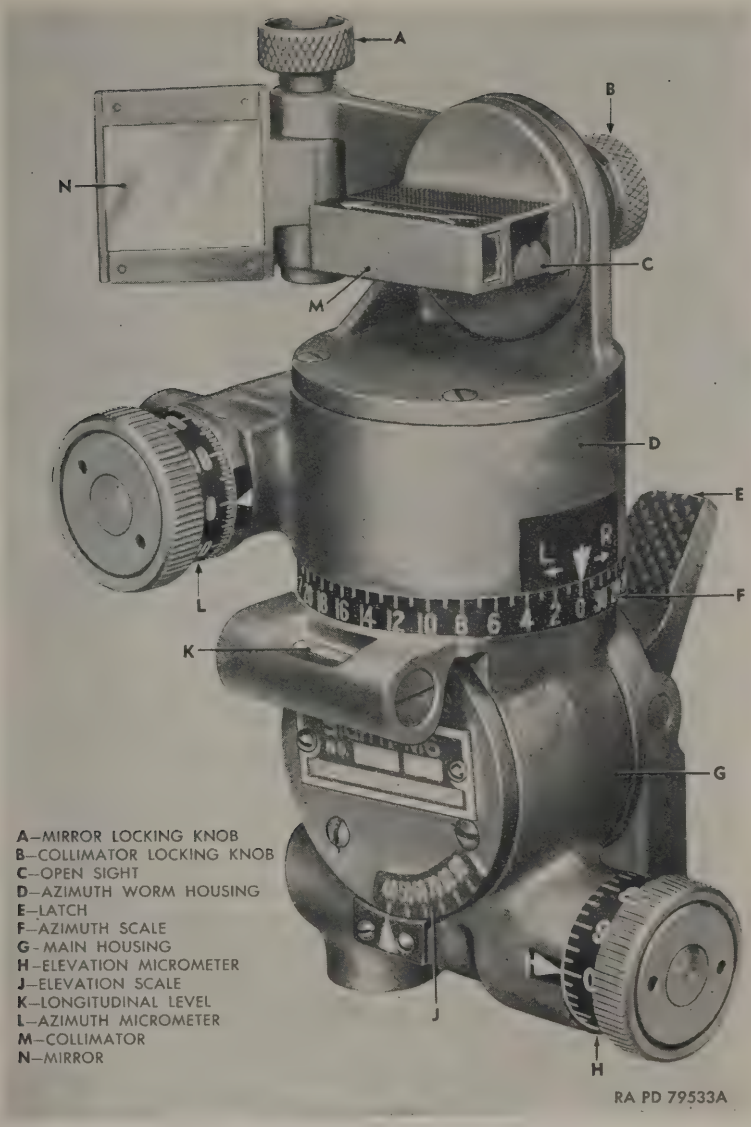

Figure 6. Sight M6—left rear view.

Figure 7. Disengaging the azimuth mechanism—sight M6.

the threads of the worm are held in complete mesh with the teeth of the gear.

g. Deflection Mechanism. The sight M4 mechanism has a torsion spring, which keeps the end of the eccentric pin in contact with one side of the deflection screw, thereby eliminating backlash between the thread and the pin when the head is rotated. The sight M6 has a worm and gear mechanism with a throw-out device for making rapid settings on the azimuth scale. Backlash is taken up by a plunger, which operates in the same manner as that in the elevation mechanism.

h. Identification. The model designation and serial number are stamped on the left side of the body on the sight M4, while the sight M6 has a name plate which carries this information.

7. Data

For data on limits of operation, weights, and dimensions, refer to TM 9–575.

CHAPTER 2

PARTS, SPECIAL TOOLS, AND EQUIPMENT FOR FIELD AND DEPOT MAINTENANCE

8. General

Tools and equipment and maintenance parts over and above those available to the using organization are supplied to ordnance field maintenance units and depot shops for maintaining, repairing, and for rebuilding the matériel.

9. Parts

Maintenance parts are listed in Department of the Army Supply Catalog ORD 8 SNL F–148 which is the authority for requisitioning replacements. Parts not listed in an ORD 8 catalog, but required by depot shops in rebuild operations, may be requisitioned from the listing in the corresponding ORD 9 catalog and will be supplied if available, when the need is substantiated. Requisitions for ORD 9 parts will contain a complete justification of requirements.

10. Common Tools and Equipment

Standard and commonly used tools and equipment having general application are authorized for issue by T/A and T/O&E. They are not specifically identified in this manual.

11. Special Tools and Equipment

a. General. The special tools and equipment tabulated in table I are listed in Department of the Army Supply Catalog ORD 6 SNL F–272. This tabulation contains only those special tools and equipment necessary to perform the operations described in this manual, is included for information only and is not to be used as a basis for requisitions.

Note. Special tool sets in ORD 6 SNL F–272, in addition to special tools, also contain standard and commonly used tools and equipment specifically applicable to this matériel.

Table I. Special Tools and Equipment for Field and Depot Maintenance

Item	Identifying No.	References		Use
		Fig.	Par.	
BLOCK, "V," sgle groove, CI, set of 3, 1¼ x 3¾ in	41–B–1472–100	8, 50, 52	11 *b*, 63	To support collimating telescope on leveling fixture.
FIXTURE, leveling*	41–F–2994	10, 15, 16, 46, 47, 48, 49, 50, 52	11 *e*, 23, 61, 62, 63	To test accuracy of elevation readings, plumb travel tests, backlash, and level vial setting.
FIXTURE, sight	41–F–2994–25	9, 15, 16, 44, 45, 46, 47, 49, 50, 52, 53, 54, 55	11 *d*, 23, 56, 59, 61, 63, 64	To support sight on leveling fixture, azimuth fixture, and on surface plate.
FIXTURE, testing, azimuth*	41–F–2995	11, 53, 54, 55,	11 *f*, 23, 64, 65	To test accuracy of azimuth and deflection readings.
KIT, instrument repair complete w/tools. The following are the special tools which are included in the KIT that are required for the maintenance of sights M4 and M6.	41–K–96		11 *j*	General.
BOX, spare parts transparent height 1¼ in, width 4¼ in, length 7¼ in.	41–B–1645	12	11 *i*, 29 *c*	To keep parts during disassembly, in their respective positions in relation to the assembled instrument.
TELESCOPE, collimating, OD 1 in, length over-all 3 $\frac{29}{32}$ in.	18–T–540–250	8, 50, 52	11 *g*, 63	To establish targets, position targets.
SCREW DRIVER, offset, dbl-end, special use, length 4 in.	41–S–1410–25		35 *b*, 51 *c*	To unscrew body head pivot, sight M4.

WRENCH, spanner, face, adj, ordnance design, diam of pin 0.07 in, No. 2.	41–W–3248–125	12, 19, 31 33, 34	11 *h*, 32 *b*, 40 *b*, 42 *a*, 42 *f*, 43 *e*, 54 *f*, 56 *a*, 57 *j*, 57 *m*, 58 *d*, 58 *g*, 58 *j*, 62 *c*	To remove and install nut, 5049970 on sight M4, nut, 5320866, nut, 5320868, cap, 5034755 and cap, 5032117 on sight M6.
PLATE, surface, CI w/handle and cover size 12 x 18 in (holes drilled in top).	41–P–1566	8, 44, 45	11 *c*, 56 *a*, 59	To provide a level reference base.
REMOVER, screw, plate, size 0.060 x 1 x 2½ in---	41–R–2373–125		33 *b*, 34 *c*	To remove retaining screws, sight M4.
WRENCH, tubular, sgle-end, pronged, OD ⅞ in, No. of prongs 2, length 1½ in.	41–W–3735–375	12, 21	11 *h*, 32 *h*, 54 *c*	To remove and install elevation worm bushing on sight M4.

* Depot maintenance only.

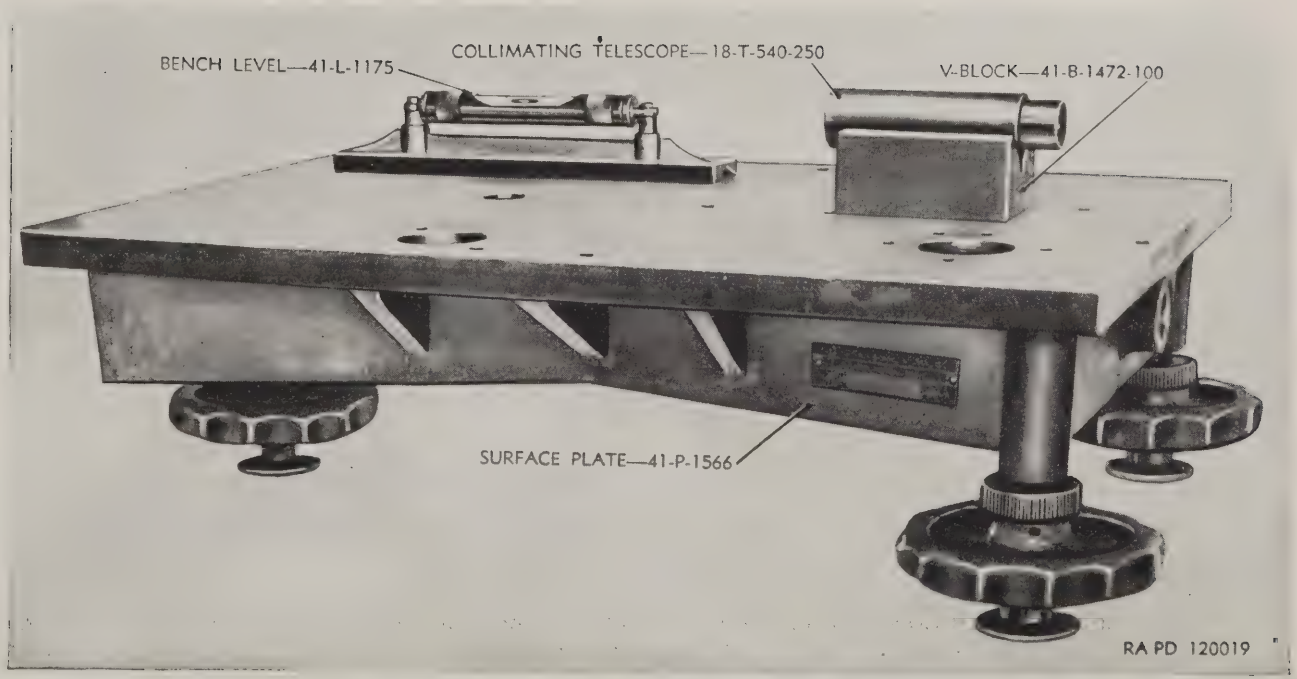

Figure 8. Surface plate, "V" block, and collimating telescope.

b. "V" Block, 41–B–1472–100. The "V" block (fig. 8) is a rectangular piece of metal having machined and ground surfaces. A "V" shaped groove is cut in one side of the block for carrying a cylindrical object. The surfaces of the "V" are truly parallel to the sides of the block so that true parallelism is insured between the sides of the block and the longitudinal axis of a cylinder resting in the "V."

c. Surface Plate, 41–P–1566. The surface plate (fig. 8) has a smooth machined and scraped surface. The surface is leveled horizontally by means of three leveling screws and the use of a bench level. Handles are provided for convenience of moving the plate from place to place.

d. Sight Fixture, 41–F–2994–25. The sight fixture (fig. 9) consists of a 90-degree angle (right angle) plate and a perpendicularity gage (circular leveling plate). Both parts have accurately machined and ground surfaces. The perpendicularity gage provides for supporting a "V" block, 41–B–1472–100 or bench level. The right angle plate has a dovetail slot formed in one side for mounting either the sight M4, M6, or the gage. The sight fixture serves as an adapter for mounting either of the sights on a surface plate, 41–P–1566 leveling fixture, 41–F–2994 or azimuth testing fixture, 41–F–2995.

e. Leveling Fixture, 41–F–2994. The leveling fixture (fig. 10) is used to determine the accuracy of the elevation readings of sights M4 and M6. Provision is made for mounting the sight fixture 41–F–2994–25 (*d* above). The leveling fixture can be leveled in a horizontal plane, and angles from 0 to 90 degrees can be measured in elevation.

f. Azimuth Testing Fixture, 41–F–2995. The azimuth testing fixture (fig. 11) is used to determine the accuracy of the deflection readings of the sight M4 or the azimuth readings of the sight M6. Provision is made for traversing the fixture and measuring angles in azimuth. Three leveling screws are provided to insure traversing in a horizontal plane.

g. Collimating Telescope, 18–T–540–250. The collimating telescope (fig. 8) is a small straight tube telescope consisting of an objective lens, reticle, and an eyepiece. The observer sees an inverted image. The instrument is carefully adjusted so that its optical axis is coincident with the mechanical axis of the telescope tube which is a straight, smooth cylinder.

h. Wrenches.

(1) The adjustable face spanner wrench, 41–W–3248–125 (fig. 12) is a hinge type flat wrench. A small pin mounted

Figure 9. Sight fixture, 41–F–2994–25.

in the face at the end of each leg is used to engage the two holes in the part to be unscrewed or installed.

(2) The tubular wrench, 41–W–3735–375 (fig. 12) has a knurled portion at one end and two square prongs at the other end for engagement with the slots of the part to be turned.

i. Spare Parts Box. The spare parts box 41–B–1645 (fig. 12) is a transparent plastic box divided into small compartments for convenience in keeping small parts together during disassembly

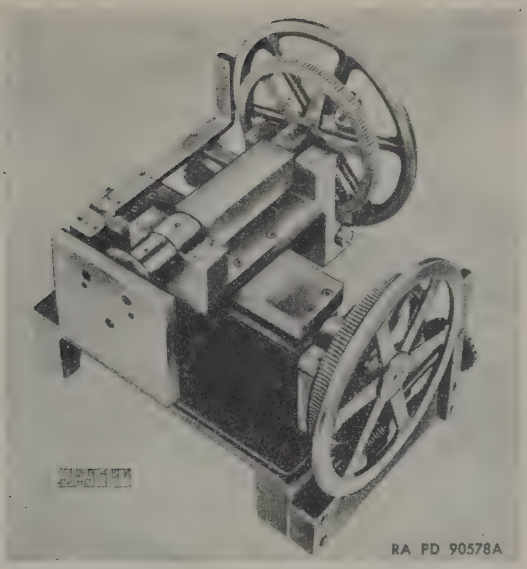

Figure 10. Leveling fixture, 41–F–2994.

and assembly operations. The box is provided with a cover to keep out dirt and dust.

j. Instrument Repair Kit. The instrument repair kit, 41–K–96, complete with tools, contains limited amounts of supplies applicable to the repair or rebuild of sights M4 and M6 and most of the common tools that are required including jeweler's screw driver and spare parts box. The kit also contains some special tools such as an adjustable face spanner wrench, 41–W–3248–125 and a collimating telescope, 18–T–540–250. The kit may be requisitioned as a set or its components may be requisitioned individually.

12. Improvised Tools

The improvised tools listed in table II apply only to field and depot shops in order to enable these maintenance organizations to fabricate these tools locally, if desired. These tools are of chief value to maintenance organizations engaged in rebuilding a large number of identical components; however, they are not essential for rebuild and are not available for issue. The following data are furnished for information only.

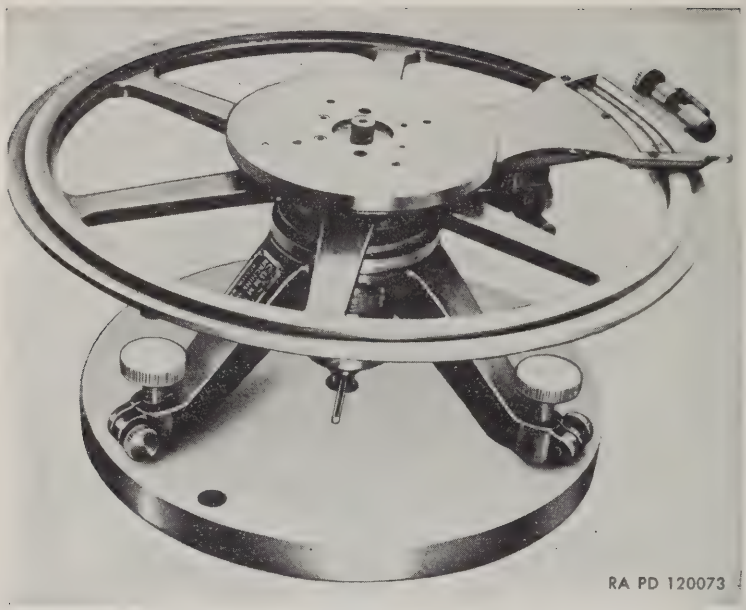

Figure 11. Azimuth testing fixture, 41–F–2995.

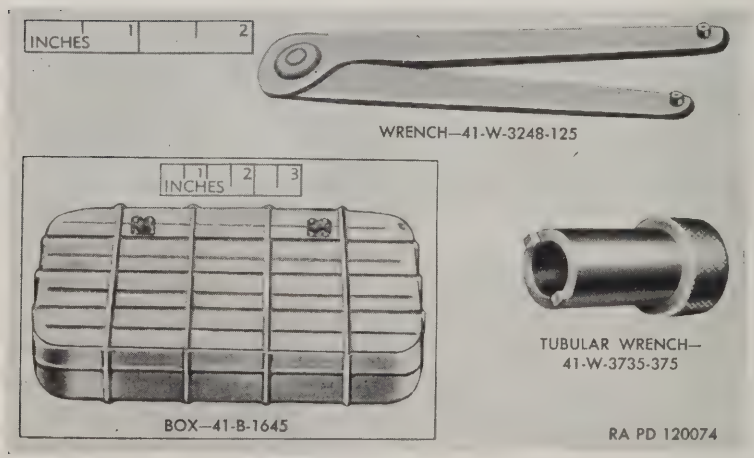

Figure 12. Special tools.

Table II. Improvised Tools for Field and Depot Maintenance

Item	References		Use
	Fig.	Par	
SCREW DRIVER, span (common screw driver, 41–S–1102 altered).	A, 13; 17, 33	31 *a*, 41 *h*, 55 *d*, 60 *e* (4)	To remove nut, 5049985 on sight M4, and nut, 5320859 on sight M6.
SCREW DRIVER, span (common screw driver, 41–S–1102 altered).	B, 13; 34	41 *a*, 41 *b*, 60 *d* (3)	To remove nut, 5320859 on sight M6.

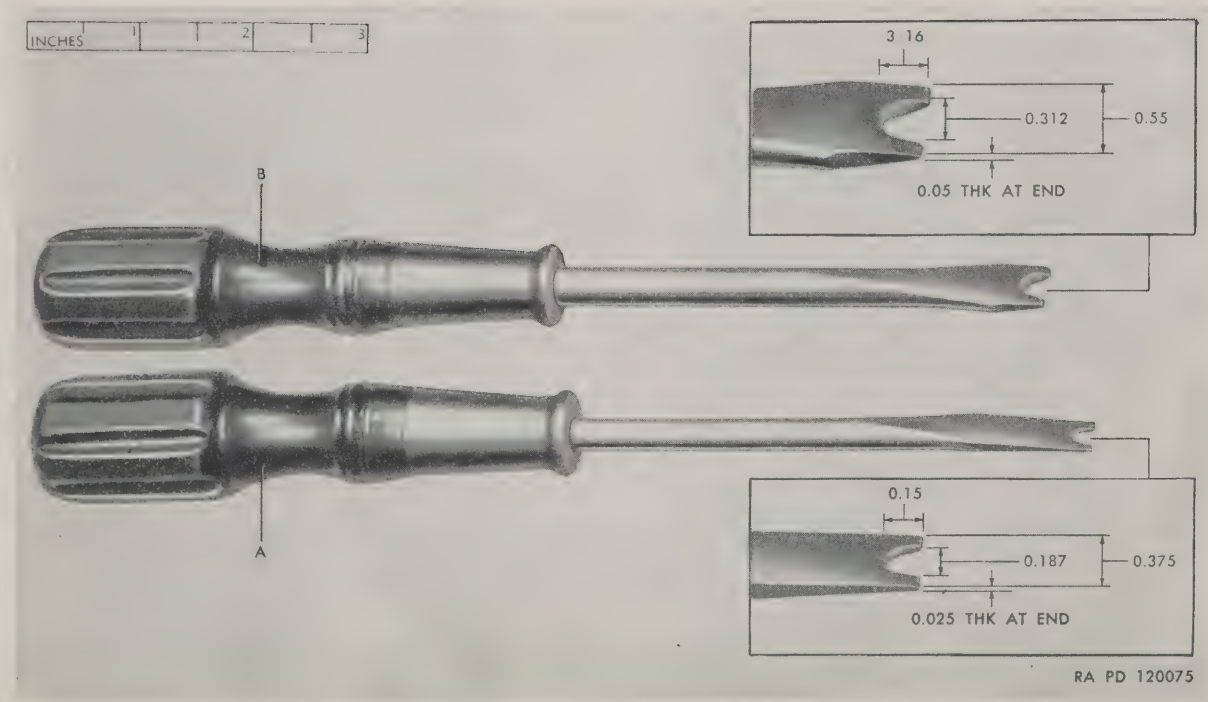

Figure 13. Improvised span screw drivers.

CHAPTER 3
INSPECTION

Section I. GENERAL

13. Scope

This chapter provides specific instructions for the technical inspection by ordnance maintenance personnel of sights M4 and M6 either in the hands of troops or when received for repair in ordnance shops. It also defines the in-process inspection of matériel during repair and rebuild and the final inspection after repair and rebuild has been completed.

14. Purposes of Inspection

Inspection is primarily for the purpose of—

(1) determining the condition of an item, i. e., serviceable or unserviceable,
(2) recognizing conditions which would cause failure,
(3) assuring proper application of maintenance policies at prescribed levels, and
(4) determining the ability of a unit to accomplish its maintenance and supply missions.

15. Categories of Technical Inspections

In general, there are five categories of inspection performed by ordnance maintenance personnel:

a. Overall Inspection. This is an overall inspection performed periodically on *all* matériel in the hands of troops. It is also performed on matériel received for repair in field or depot maintenance shops. Upon completion of an inspection for serviceability, matériel will be declared either serviceable or unserviceable. This inspection may be limited in scope, such as an inspection of matériel in the hands of troops, or detailed in scope, such as an ordnance shop inspection. Detailed procedures are presented in section II.

b. Pre-embarkation Inspection. This inspection is performed on matériel in the hands of troops alerted for oversea duty to insure

that such matériel will not become unserviceable or worn out in a relatively short time. It prescribes a higher percentage of remaining usable life in serviceable matériel to meet a specific need beyond minimum serviceability.

c. In-process Inspection. This inspection is performed by the repair technician and/or floor inspector in the process of repairing or rebuilding the matériel and its components. It insures that all parts conform to prescribed standards, that the workmanship is in accordance with approved methods and procedures, and that deficiencies not disclosed by the technical inspection are found and corrected. Detailed instructions are contained in chapter 5.

d. Final Inspection. This is an acceptance inspection performed by a final inspector, after repair or rebuild has been completed, to insure that the matériel is acceptable according to established standards. Detailed instructions are contained in chapter 6.

e. Spot Check Inspection. This is a periodic over-all inspection performed on only a percentage of the matériel in each unit to determine the adequacy and effectiveness of organizational and field maintenance.

16. Classification of Matériel

All ordnance matériel after inspection is classified as follows:

a. Serviceable. Serviceable property consists of all new or used supplies which are in condition for issue for the purpose intended and all supplies which can be placed in such condition through pre-issue tests or inspections, in-storage deprocessing, installation of accessories, correction of minor deficiencies which have developed since the item was last classified as serviceable, application of modification work orders for which parts are available, or assembly of available components.

b. Unserviceable. Unserviceable property consists of all supplies which are not serviceable (*a* above). The definition of unserviceable property is further broken down into the following subclassifications: property which is unserviceable but economically repairable, property which is unserviceable and not economically repairable.

Section II. INSPECTION OF SIGHTS M4 AND M6 IN THE HANDS OF TROOPS

17. General

This section provides specific instructions for the technical inspection by ordnance maintenance personnel of sights M4 and M6

in the hands of troops. Also, this section amplifies the general instructions contained in TM 9–1100 insofar as the instructions pertain to inspection of sights M4 and M6.

18. Forms and Reports

Authorized forms and reports for technical inspections are prescribed in TM 9–1100. For additional authorized forms and reports for field and depot maintenance, refer to paragraph 3.

19. Inspection of Mechanical and Optical Components

a. General. The inspection procedures and standards listed below apply to all types of sights. Personnel making these inspections will acquaint themselves with the malfunctions (refer to chap. 4) which are the most common deficiencies of the sights M4 and M6. In general, if the sight is complete and performs its intended function properly, if all modification work orders classified as urgent have been completed, and if all defects as disclosed by the inspection have been corrected, the sight may be considered serviceable. Inspector should refer to TM 9–575 for checking performance of general maintenance and preventive maintenance schedules.

b. Inspection of Mechanical and Optical Parts. Inspect the mechanical and optical parts of the sight as instructed in (1) through (12) below.

(1) *Completeness.* Examine the sight to see that all component parts are present including bolts, screws, pins, knobs, etc.

(2) *Appearance.* The appearance of the sight will indicate its general condition and will reflect the type of treatment it has received. Examine the sight for dented surfaces, bent or broken parts, moisture and corrosion, and evidence of damage or misuse which might indicate the need for repair. Check condition of open sight and collimator. The dovetail mounting surfaces will be free of paint, nicks, or burs. The level vials will not be cracked, broken or loose in the holder. The level vial setting plaster sometimes pulls away from the level vial leaving it loose in its setting. Check this condition, by tapping the level vial with the finger.

(3) *Functioning of mechanical components.*

(*a*) *General.* Mechanical components must operate smoothly without binding or rough motion. Parts

must be free from grit and must be properly lubricated. A loose knob or a movement that is alternately tight and loose at each half revolution usually indicates a bent worm shaft. Check for backlash (pars. 62*d* and 65*b*). An external visual inspection or a hand feel for looseness of brackets, and lock washers, must be made. Check for a broken or weak latch spring.

(*b*) *Sight M6.* When the mirror locking shaft is loosened, the mirror will move freely on its hinge. When the shaft is tightened, the mirror (fig. 6) will be locked firmly in position. When the locking knob is loosened, the collimator assembly will be free to move in a complete revolution. When tightened, the assembly will be locked firmly in position. Check throw-out action of the deflection knob. When the knob is pushed toward the front of the sight (figs. 6 and 7), the worm will be clear of the worm gear so that the head can be turned freely to any setting on the deflection scale.

(*c*) *Sight M4.* Considerable pressure will be required to elevate or depress the line of sight of the collimator (fig. 4).

(4) *Sealing.* Inspect the sealed and painted portions of the instrument to determine whether sealing is complete.

(5) *Modification work orders.* All pertinent modification work orders must be applied.

(6) *Name plates, scales, and indexes.* Inspect scale numbers, divisions and indexes, and lettering on name plates to see that they are clearly defined and easily read.

(7) *Paint and finish.* Inspect for bare spots or damaged finish which may expose bare metal and lead to corrosion.

(8) *Lubrication.* Sliding surfaces, hinge joint latches, and other movable parts will be cleaned, properly lubricated, and free from rust and other foreign matter. Refer to paragraph 29*h*.

(9) *Cracks.* Castings should be inspected for cracks and breaks.

(10) *Spare parts and equipment.* Check against ORD 7 SNL F–148 for completeness of matériel and equipment. Check the carrying cases for general appearance. Check all metal, leather, and wood components (carrying case M14) including straps and buckles to make sure they are clean and free of corrosion, rot, mold, tears, broken

stitching, breaks, and loose paint. Examine all the supports in the carrying case for rigidity and padding. Check the carrying case lid to see that it is not bent out of shape, that it can be easily opened and closed, and that the gaskets are in place and in good condition. Check the latch to see that it holds and locks the lid in place.

(11) *Condition of optical elements.* Lenses, reticles, and mirrors must be free from scratches, pits, dirt, and chips that will interfere with the optical performance of the instrument. When inspecting through the eyepiece end, rejection is to be based only on those defects that are apparent when the instrument is used in a manner simulating field conditions. Mirrors will not have any scaling of the silver. The reticle line of the collimator will be in a vertical position and clearly visible.

(12) *Adjustment of optical elements.* Performance of the instrument must be such that the reticle as seen through the eyelens is in clear focus.

20. Inspection and Testing Equipment

The tools listed in table III are used for adjustment of the sights M4 and M6 when the performance tests of paragraph 21 below indicate the micrometers of sight M6 or the elevation micrometer and deflection mechanism of sight M4 must be adjusted

Table III. Special Tools for Field Inspection, Testing, and Adjustment

Item	Identifying No.	References		Use
		Fig.	Par.	
QUADRANT, gunner's, M1.	F001–0040630	14	21	Setting elevation micrometers in the field.
WRENCH, spanner, face, adj, ordnance design, diam of pin 0.07 in, No 2.	41–W–3248–125	12	11 *h*, 21	To turn the round nut which secures the elevation and azimuth micrometers.

21. Performance Tests

The elevation and deflection mechanisms of sights M4 and M6 must conform to the following performance tests.

a. Elevation Test. For the sight M6, cross level the mortar by centering the cross-level bubble of the mortar mount. For the sight M4, cross level the mortar by centering the bubble in the cross-level vial of the sight. With a gunner's quadrant M1 placed on the quadrant seat (when available) of the mortar tube or resting against the mortar tube (when quadrant seat is not available), elevate the mortar to 1,067 mils (60 degrees) (fig. 14). Turn the elevating knob of the sight until the bubble of the longitudinal level is centered. The elevation index should coincide with the 60-degree graduation on the elevation scale. The zero graduation of

Figure 14. Setting the mortar to 60-degree elevation.

the elevation micrometer must be opposite its index. If the zero graduation does *not* coincide with its index, adjust as follows:

(1) Without disturbing the setting of the mortar and sight, hold the elevating knob, loosen the round nut in the end of the knob with the adjustable face spanner wrench, 41–W–3248–125, and slip the micrometer until the zero graduation is opposite its index. Tighten the nut and check to see that the micrometer has not slipped.

(2) No adjustment is provided for the elevation scale, but on the sight M6 the elevation scale index can be adjusted. With the mortar and sight set according to (*a*) above, loosen the two screws on the elevation scale index and slip it until it indicates 60 on the scale. Tighten the screws and check to see that the index has not slipped.

b. Deflection Test. With the flat surface of the bracket clamped against a long, flat, vertical surface, sight along the surface at a distant object. Check the alinement of the line of sight of the open sight with the line of sight of the collimator. Where collimator C69998, is out of alinement, replace with collimator 7693-650. When collimator 7693650, is out of alinement, bring lines of sight into coincidence by adjusting the screws on the side of the collimator body. Rotate the deflection knob of the sight M4 or the azimuth knob of the sight M6 until the line of sight of the collimator falls on the same object sighted above. The zero of the deflection micrometer of the sight M4 must coincide with its index. The zeros of the azimuth scale and micrometer of the sight M6 also must coincide with their respective indexes. Failure of coincidence in any of the above instances will require adjustment as follows:

(1) With the sight set according to *b* above, loosen the nut in the end of the azimuth knob (sight M6) with the adjustable face spanner wrench, 41–W–3248–125 (fig. 12), and slip the micrometer until it reads opposite its index. Tighten the nut and check to see that the micrometer has not slipped. No adjustment is provided for the azimuth scale.

(2) With the sight set according to *b* above, rotate the deflection knob (sight M4) until the zero on the deflection scale registers opposite its index. If the line of sight of the collimator, C69998, falls to the right of the object, back out the right-hand head adjusting screw (fig. 3) a slight amount and tighten the left screw, repeating the procedure until the line of sight falls on the object. If

the line of sight falls to the left of the object, reverse the procedure described above. With the adjustment properly accomplished, both screws must be tight.

Section III. ORDNANCE SHOP INSPECTION

22. General

Technical inspection performed by the ordnance repair shop upon receipt of matériel turned in for repair, determines the extent of repairs required, and provides the basis for requisitioning the parts, assemblies, or supplies necessary to accomplish the repairs. Often this inspection in the shop may be the same as that performed by inspectors in the field. It may disclose additional necessary repairs not indicated by the using organization. However, additional testing equipment is available at the ordnance shop to perform tests which cannot be accomplished in the field. The mechanical and optical parts in addition to being inspected, according to paragraph 19*b*(1), (2), and (7), therefore, should also be inspected for the standards outlined in paragraph 23.

23. Inspection

Attach the right angle plate of the sight fixture, 41–F–2994–25 to the leveling fixture, 41–F–2994 and install either the sight M4 or M6 (figs. 15 and 16 and par. 61). Elevate the leveling fixture 15 degrees. Cross level the fixture. Turn the elevation micrometer of the sight until the longitudinal level vial bubble is centered. The sight should meet the following conditions:

a. The elevation index should coincide with the 60-degree graduation, and the zero graduation of the elevation micrometer should be opposite its index.

b. The cross-level vial bubble of the sight M4 should be centered within one division of the vial graduations. There is no cross level on the sight M6.

c. When the deflection micrometer of the sight M4 reads zero or when the azimuth scale and micrometer of the sight M6 reads zero, the line of sight of the collimator (reticle line) should fall in a vertical plane, parallel to the flat contact surface of the mounting bracket within a tolerance of $\pm 1\frac{1}{2}$ mils for the M4 and ± 3 mils for the M6 (par. 62*a*).

d. The plane of sight of the open sight should be parallel to the plane of sight of the collimator within ± 5 mils (par. 62*b*) (M4 only).

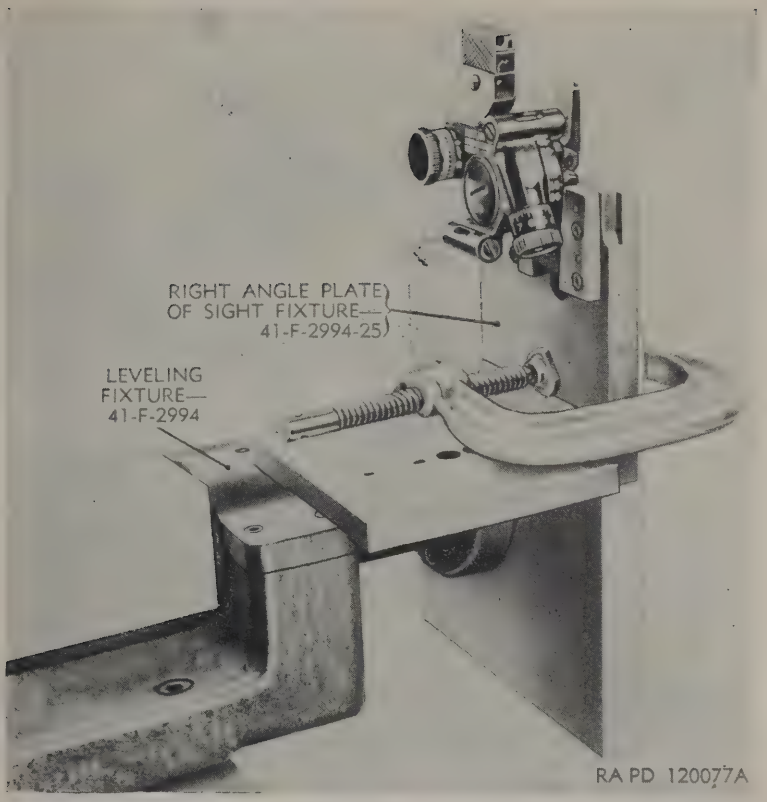

Figure 15. Sight M4 mounted for tests on the leveling fixture.

e. At 0 deflection setting or 0 azimuth setting, the reticle line of the collimator will not deviate from a plumb line more than 1 mil when the sight is elevated from 40 degrees to 90 degrees while the leveling fixture 41–F–2994 (figs. 15 and 16) is depressed to keep the longitudinal level vial bubble centered. The cross-level vial bubble of the sight M4 should remain central within two divisions.

f. With the flat contact surface of the mounting bracket of the sight truly vertical (cross-level vial bubble of the sight M4 in central position) and the bubble of the longitudinal level vial centered, the reticle line of the collimator should not deviate from a plumb line more than 3 mils when the collimator assembly is elevated and depressed about its pivot screw.

g. The following accuracy tests will be performed on the leveling fixture, 41–F–2994 and azimuth testing fixture 41–F–2995:

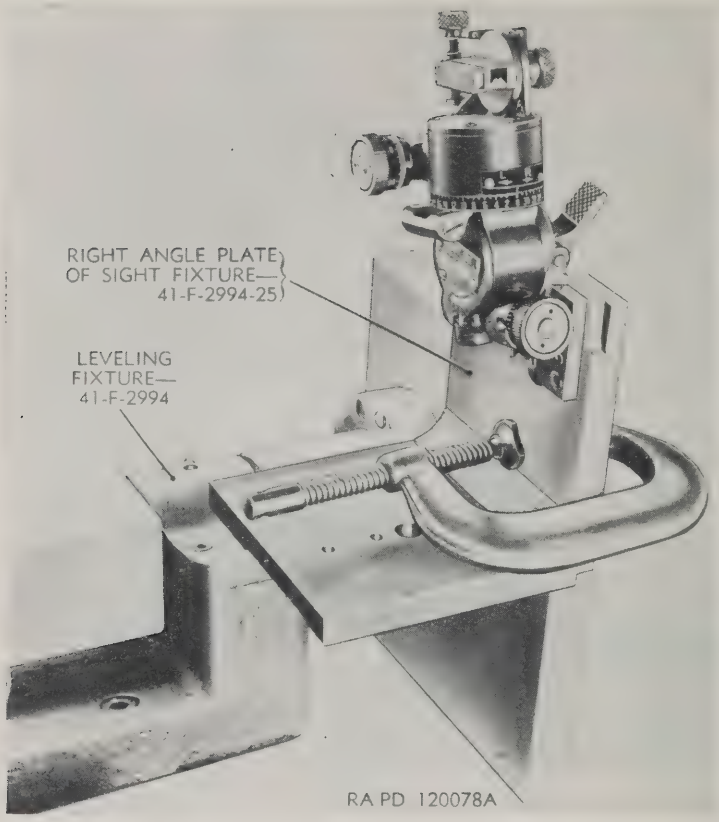

Figure 16. Sight M6 mounted for tests on the leveling fixture.

(1) The sight will be tested for accuracy of elevation readings at not less than nine different settings for the M4, and six different settings for the M6, selected by the inspector, between 45 and 85 degrees. Accuracy of deflection or azimuth readings will be tested at not less than five different settings.

(2) The error in any elevation reading between 45 and 85 degrees will not exceed ±10 minutes (par. 62*c*).

(3) The error in any deflection (azimuth) reading will not exceed ±3 mils (par. 65*a*).

(4) Backlash in the elevation movement will not exceed 5 minutes (par. 62*d*).

(5) Backlash in the deflection (azimuth) movement will not exceed 2 mils on the M4 or 1 mil on the M6 (par. 65*b*).

(6) Vertical displacement of the line of sight due to reversing the deflection movement, by means of the azimuth knob, will not exceed one-half mil for sight M6 (par 65*c*).

Section IV. PRE-EMBARKATION INSPECTION

24. General

Inspection for outward appearance of the sights M4 and M6 is of importance as well as mechanical condition. Where any doubt exists as to the utility of an assembly or of the sights M4 and M6, that assembly or the sight must be replaced by a truly serviceable item. Equipment, when inspected, must approach new equipment standards of operation and appearance, and the workmanship and quality of the end product must reflect the highest standards obtainable. To assure that all items, insofar as practicable, possess original appearance, it is desired that items normally painted be repainted if painted surfaces show signs of damage.

25. Inspection

a. The specifications, standards, and operations intended as a guide to insure satisfactory performance and acceptability of the sights M4 and M6 are found in paragraphs 19 to 23, inclusive.

b. For inspection procedures to be performed on equipment prepared for operation under unusual conditions, the inspector should refer to TM 9–575.

c. All modification work orders other than those designated as optional must have been applied. For those modifications not yet accomplished, requisitions will be submitted to the appropriate agency for the necessary material to be forwarded to the unit when available.

CHAPTER 4
TROUBLE SHOOTING

26. Purpose

Trouble shooting is a systematic isolation of defective components by means of symptoms, tests to determine the defective components, and application of remedies. The scope of the level of ordnance maintenance will govern the tests and remedies which may be applied.

27. Procedure

Those malfunctions which may occur in the case of the sights M4 and M6 are listed in table IV along with the probable cause and the corrective action. Upon the occurrence of any unforeseen malfunction (those not listed in table IV) determine the probable cause and take necessary corrective action.

Table IV. Trouble Shooting

Malfunction	Probable causes	Corrective action
Sight does not seat firmly on mortar yoke	Sights M4 and M6 Weak or broken mounting latch torsion spring; burs prevent the bracket from entering the dovetail slot in the yoke enough for the latch to secure the sight.	Replace latch spring (pars. 33*h* and *i* and 53*a*, *b*, and *c*). Remove burs (par. 29*d*).
Image not clearly defined	*a*. Improper distance between reticle and eyelens.	*a*. Add or remove diaphragms until proper focus is obtained (pars. 37, 41*o*, 49, 50, 60*a*).
	b. Dirt or moisture on inside of eyelens	*b*. Remove eyelens and clean.
Line of sight of collimator and flat contact surface of bracket mounting are not parallel.	Sight M4 *a*. Improper adjustment of head adjusting screws.	*a*. Adjust head adjusting screws (par. 21*b*).
	b. Bent collimator support	*b*. Replace collimator tube.
	Sight M6—Azimuth micrometer out of position.	Reposition micrometer (par. 21*a*(2)).
Line of sight of reticle and open sight are not parallel.	*a*. M4 with collimator—7693650, positioning screws out of adjustment.	*a*. Adjust reticle position with screws (par. 21*b*).
	b. M4 either collimator and M6. (1) Bent open sight	(1) Straighten and aline.
	(2) Bent body	(2) Replace body or tube.
Backlash in elevation movement	Sight M4—Insufficient tension in the spring washer on the worm shaft; weak torsion spring; a bind in the worm gear.	Bend spring washer to increase tension, or replace torsion spring. Free worm gear.
	Sight M6—Improper adjustment of worm ball cap or plunger plug.	Tighten ball cap and/or plunger plug.

Table IV. Trouble Shooting—Continued

Malfunction	Probable causes	Corrective action
Backlash in deflection or azimuth movement.	Sight M4—Weak torsion spring and/or insufficient tension in spring washer.	Replace torsion spring or bend spring washer to increase tension.
	Sight M6—Improper adjustment of worm ball cap or plunger plug.	Tighten ball cap and/or plunger plug.
Elevation mechanism turns beyond limits	Sight M4—Broken stop screw, 5049990 bracket assembly.	Replace stop screw, 5049990.
Cross-level vial bubble will not center when sight is cross leveled.	Vial is loose in its housing	Remount the level vial in its housing (par. 56*b* and *c*).
	Vial not installed properly	
Performance tests indicate that the elevation micrometer does not read correctly.	Micrometer out of position	Loosen round nut in the end of the knob, slip micrometer to the correct position opposite its index, tighten knob and nut.
Elevation scale does not read correctly when the sight M6 is leveled.	Elevation index has slipped from correct position.	Loosen screws holding the index plate and shift the index plate until it is midway between 40 degrees and 50 degrees on the elevation scale.
Longitudinal level bubble will not center when body is level.	Level vial is loose or out of position in housing.	Sight M4—Reposition the level vial (par. 56*a* and *c*).
		Sight M6 (par. 59).

CHAPTER 5
REPAIR AND REBUILD

Section I. GENERAL MAINTENANCE

28. General

a. Information and instructions contained herein are supplementary to instructions for the using organization contained in TM 9–575. Organizational maintenance covers the cleaning, lubrication, and inspections performed by the using arm.

b. This chapter contains general and specific maintenance instructions for the repair and rebuild of each major component. In the following sections, specific adjustments, repairs, and rebuild procedures are described in order to restore each major component to a serviceable condition.

29. General Methods

The following general procedures should be observed during repair and overhaul operations.

a. Tools. Use only wrenches that fit snugly on parts. Tools that do not fit will fail or cause damage to the corners of bolt heads, nuts, screws, etc.

b. Sealing. All external recessed headless screw holes should be sealed with sealing or plugging cement.

c. Handling of Disassembled Parts. A parts tray or suitable receptacle, such as box, 41–B–1645 (fig. 12), should be provided so that parts, as removed, can be placed in their respective positions in relation to the assembled instrument. Always keep the relative position of parts until the instrument is completely assembled. This is especially important where the technician who assembles the unit is not the one who disassembled it.

d. Removal of Burs. Remove burs on the dovetail bracket and latch with a fine mill file. Burs on threads can be removed by running a tap or die over the thread, but the tap or die must be the same thread as the piece on which the burs are being removed.

A thread chaser can be used on large threads, if a tap or die is not available.

e. Removal of Pins. The pin should be examined to determine whether it is tapered or straight. Tapered pins should be driven out from the smaller end. All pins should be driven out with a drift. The drift diameter should be approximately the same as the smaller end of the pin to prevent mushrooming of the pin. The adapter, which is holding the pin, should be rigidly supported while the pin is being driven out (fig. 20).

f. Cleaning.

(1) *Mechanical parts.* Maintenance personnel should use dry-cleaning solvent or volatile mineral spirits, and a stiff bristle brush for cleaning grease and dirt from mechanical parts. After cleaning, the parts should be dried with a lint free cloth.

(2) *Optical elements.* For initial cleaning of an element after removal from the cell or holder, remove dust, lint, or other foreign matter by blowing with an air bulb or by brushing with a camel's hair brush, then apply a few drops of liquid lens cleaning soap. Rub the surfaces gently with a piece of lens tissue paper until clean and wipe dry with a piece of clean lens tissue. For final cleaning prior to insertion of a lens in a cell or instrument, place the lens in a lens holder. Wrap a small piece of lens tissue paper around and over the end of a wood or plastic applicator. Moisten the paper with the cleaning soap and proceed to clean the lens by rotating the applicator, starting at the center of the lens and cleaning outward with a circular motion. Repeat the operation if necessary.

g. Handling Optical Elements as Removed. Never touch a lens on its polished surface. When the eyelens and reticle are to be laid aside, they must be wrapped in a piece of lens tissue paper. When storing optical parts, always clean and wrap them completely in lens tissue paper.

h. Lubrication. The sights M4 and M6 will be lubricated with aircraft and instruments lubricating grease. The lubricant will be applied sparingly to provide smooth and reasonably free movement, particularly during periods of extreme cold. Lubricate when necessary and at time of repair and rebuild. Lubrication of this matériel will be performed *only* by ordnance personnel, with the exception, that external parts such as hinges and knobs may be lubricated by the using organizations. For such external parts,

the use of aircraft instrument lubricating oil is prescribed; this oil supersedes preservative lubricating oil, special. The using organization may also lubricate exposed bearing surfaces with a thin film of aircraft and instruments lubricating grease, which provides, in addition to lubrication, protection against corrosion.

30. Surface Finishes

a. Surface finishes are applied to fire control instruments for the following reasons:

(1) For protection against weather and climate.

(2) For camouflage purpose.

(3) Internally to decrease stray reflection into the optical path or to increase illumination of lighting systems.

(4) To guard against unauthorized internal repairs and to reveal indication of tampering.

(5) For appearance and the promotion of pride in equipment and thus conducive to careful handling.

b. Tables V, VI, and VII show the surface treatment and the intermediate and top coat finishes that are required to duplicate the original finish.

c. Where complete refinishing is not required, touch-up painting is performed with the top coat material using one or more coats as necessary to build up to original finish. Touch-up painting should be limited to relatively few, small isolated areas, so that the finished instrument does not present an unsatisfacory mottled appearance.

d. Finish materials may be requisitioned from Department of the Army Supply Catalog ORD 3 SNL K–1. Application of finishes is covered in TM 9–850, TM 9–1861, and TM 9–2851.

Table V. Surface Finishing of Sight M4

Assemblies and parts	Figure reference	Location	Surface treatment and intermediate coating	Top coat or final treatment
ADAPTER, micrometer, 5049971	22	Entire piece	Chemical	Enamel, synthetic, gloss, black
		Exposed surfaces	Primer, enamel, synthetic, corrosion resisting.	
BODY, 6529390	28	Entire piece	Anodic film	Enamel, synthetic, gloss, black
		Nonbearing exterior finished surfaces.	Primer, zinc chromate	
		Engravings		Filler, graduation, white
BODY, collimator, 7693651		Entire piece	Chemical impregnation and anodic film.	
		External surfaces after assembling.	Primer, zinc chromate	Enamel, synthetic, gloss, black
BRACKET, mounting, 6529391	25	Entire piece	Chemical impregnation and anodic film.	
		Exterior unfinished surfaces.	Primer, zinc chromate	Enamel, synthetic, gloss, black
		Elevation index		Filler, graduation, white
BUSHING, elevating worm, 5049975	22	Entire surface	Oxide black	
DIAPHRAGM, collimator (alternate), 5034615.	30	Entire piece	Bake	Varnish, moisture and fungus resistant
DIAPHRAGM, collimator, 7592239		Entire piece	Bake	Varnish, moisture and fungus resistant
DIAPHRAGM, collimator (alternate), 7633940.	30	Entire piece	Oxide black	
DIAPHRAGM, collimator, 7592238		Entire piece	Oxide black	
EYELENS, collimator (alternate), 5035576.		Border		Lacquer, optical lens, edging, black

GEAR, worm, elevation, 6138172	24	Entire surface	Oxide black	
HEAD, body, 5569996	27	Entire surface	Anodic film Chemical impregnation.	
		Nonbearing surfaces	Primer, zinc chromate	Enamel, synthetic, gloss, black
HOLDER, collimator reticle, 7644140		Entire surface	Oxide black, oiled	
KNOB, elevating worm (riveted), 7641577.	22	Entire surface	Chemical	
		Exposed surfaces	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
LATCH, mounting, 5556411	25	Nonbearing surfaces	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
MICROMETER, elevation, 6138173	22	Graduated surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
		Engravings		Filler, graduation, white
NUT, round, 0.393–32NS–3 x $\frac{3}{16}$ thk, 5049970.	22	Entire surface	Chemical	
		Exposed surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
NUT, round, slotted, No 5–44NF–3 x $\frac{1}{8}$ thk, 5049985.	18	Entire surface	Chemical	
		Nonbearing surfaces	Primer, zinc-chromate	Enamel, synthetic, gloss, black
PIN, eccentric, deflection screw, 5049982.	27	Entire surface	Chemical	
		Top surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
PIN, hinge, latch, 5043135	25	Entire surface	Chemical	
		Ends after assembly	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
PIN, stght, chamfered, $\frac{3}{32}$ x $\frac{5}{32}$, 109576	26	Exposed end	Primer, zinc-chromate	Enamel, synthetic, gloss, black
PIVOT, body head, 5049981	27	Entire surface	Chemical	
PLUG, 0.393–32NS–3 x $\frac{1}{8}$ thk, 5049989.	28	Entire surface	Anodic film	
		Exposed surface	Primer, zinc-chromate	Enamel, synthetic, gloss, black
RETAINER, collimator eyelens, 7592242.		Entire surface	Oxide black; oiled	

Table V. Surface Finishing of Sight M4—Continued

Assemblies and parts	Figure reference	Location	Surface treatment and intermediate coating	Top coat or final treatment
RETAINER, collimator eyelens (alternate), 5043120.	30	Entire surface	Oxide black	
RETAINER, collimator reticle, 7592241.		Entire surface	Chemical	
RETICLE, collimator (alternate), 5043118.	30	Plated surface		Varnish, shellac, bleached
RETICLE, collimator, copper, 7592244.		Entire surface	Oxide black; oiled	
RING, retaining, 0.783 ID x 1.10 OD x 0.15 thk, 5049978.	24	Entire surface	Chemical	
SCREW, clamping, collimator, assy, 6179845.	18	Entire surface	Chemical	
		Screw head and flat end.	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
SCREW, deflection, 5569997	26	Entire surface	Oxide black	
		Exposed surfaces	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
		Engravings		Filler, graduation, white
SCREW, retaining, deflection screw, 5049986.	26	Entire surface	Anodic film	
		Head and exposed end	Primer, zinc-chromate	Enamel, synthetic, gloss, black
SCREW, retaining, elevation worm gear, 5049979.	24	Entire surface	Anodic film	
		Top of head	Primer, zinc-chromate	Enamel, synthetic, gloss, black
SCREW, set, hdls, fl-pt No. 5–44NF–3 x $\frac{3}{16}$, 503885.	26	Exposed surface	Primer, zinc-chromate	Enamel, synthetic, gloss, black
SCREW, special hdls, cone-pt No. 5–44NF–3 x $\frac{5}{16}$, 5049983.	27	Exposed surface	Primer, zinc-chromate	Enamel, synthetic, gloss, black

SCREW, special, hdls, dog-pt No. 5–44NF–3 x 3/16, 5049976.	24 22	Exposed surface	Primer, zinc-chromate	Enamel, synthetic, gloss, black
SCREW, special, hdls, fl-pt No. 8–36NF–3 x 7/16, 5049990.	24	Entire surface	Chemical	
SEPARATOR, collimator (alternate), 5035578.	30	Entire surface	Oxide black	
SPRING, torsion, body head, 5049980	27	Entire surface	Zinc plate; bake	
SPRING, torsion, mounting bracket, 5049977.	24	Entire surface	Zinc plate; bake	
SPRING, torsion, 0.063 diam stock, 3 3/4 OD, 3½ coil, 5043139.	25	Entire surface	Zinc plate; bake	
TUBE, collimator (brazed and riveted) (alternate), 7673064.	30	Entire surface	Oxide black	
		Exterior surfaces	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
WASHER, plain, 0.29 ID x 21/32 OD x 1/32 thk, 5049973.	22	Entire piece	Bake	Varnish, moisture and fungus resistant
WASHER, plain, 17/32 ID x 7/8 OD x 1/32 thk, 5049988.	26	Entire piece	Bake	Varnish, moisture and fungus resistant
WASHER, plain, 0.282 ID x 0.453 OD x 1/64 thk, 7592022.	22	Entire piece	Bake	Varnish, moisture and fungus resistant
WASHER, spring, 0.29 ID x 21/32 OD x 0.022 thk, 5049974.	22	Entire piece	Zinc plate, bake	
WASHER, spring, 0.318 ID x 0.490 OD x 0.014 thk, 7592023.	27	Entire piece	Zinc plate, bake	
WASHER, spring, 17/32 ID x 7/8 OD x 1/32 thk, 5049987.	26	Entire piece	Zinc plate, bake	
WORM, elevating, 6138171	22	Entire piece	Chemical	

Table VI. Surface Finishing of Sight M6

Assemblies and parts	Figure reference	Location	Surface treatment and intermediate coating	Top coat or final treatment
ADAPTER, collimator, 5320850	35	Entire piece	Oxide black	Enamel, rust-inhibiting, OD
		Exposed surfaces of head.	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, OD
ADAPTER (riveted), 6270958	39	Entire piece	Oxide black; lacquer, rust-inhibiting.	Enamel, rust-inhibiting, OD
	40	Exposed surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, OD
BODY, collimator (brazed), 6270953	38	Exterior nonbearing surfaces.	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
		Arrow		Filler, graduation, white
BRACKET, collimator, 6270951	35	Unfinished surfaces	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
BRACKET, mounting latch, 6574274	41	Exterior unfinished surfaces and latch cavity.	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
CAP, ball, ⅝, 5034755	39	Exposed surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
DIAPHRAGM, collimator, 5034615	38	Entire piece	Bake	Varnish, moisture and fungus resistant
DIAPHRAGM, collimator, 7633940	38	Entire piece	Oxide black	
EYELENS, collimator, 5035576	38	Border		Lacquer, optical lens, edging, black.
HOLDER, collimator mirror, 5320855	36	Entire surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
HOUSING, azimuth worm, 5630842	39	Exterior unfinished surfaces.	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD

HOUSING, main, 6574275	42	Exterior unfinished surfaces.	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD
				Enamel, synthetic, gloss, OD
		Engraved surfaces	Enamel, synthetic, gloss, black	
		Graduations		Filler, graduation, white
INDEX, elevation, 5320869	40	Engraved surface and edge.	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
		Arrow		Filler, graduation, white
INDEX, scale, 7579549	39	Engraved surface and edge.	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
		Engraving		Filler, graduation, white
KNOB, ⅝ OD, 5320860	37	Entire piece	Oxide black; lacquer; rust-inhibiting.	
		Nonbearing surfaces	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD
				Enamel, synthetic, gloss, OD
KNOB, ¾ OD, 5320851	35	Entire piece	Oxide black; oiled	Enamel, rust-inhibiting, OD
		Nonbearing surfaces	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, OD
KNOB, 1⅛ OD, 5320864	39	Entire piece	Oxide black; lacquer; rust-inhibiting.	Enamel, rust-inhibiting, OD
	40	Exposed surfaces	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, OD
LATCH, mounting, 5630838	41	Entire surface except pin hole.	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
MICROMETER, azimuth, 5320865	39	Graduated surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
		Graduations		Filler, graduation, white
MICROMETER, elevation, 5320872	40	Graduated surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
		Graduations		Filler, graduation, white
MIRROR, collimator, 5320856	36	Back surface	Silver plated, copper plated	Varnish, shellac, orange; gutta percha

Table VI. Surface Finishing of Sight M6—Continued

Assemblies and parts	Figure reference	Location	Surface treatment and intermediate coating	Top coat or final treatment
NUT, rd, No. 8–36NF–3 x $\frac{3}{16}$ thk, 5320859.	35	Entire piece	Oxide black; oiled	
		Nonbearing surfaces	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
NUT, rd, No. 8–36NF–3 x 0.312 lg, 5320858.	35	Entire piece	Oxide black; oiled	
NUT, rd, ¼–28NF–2 x 0.10 thk, 5320852.	35	Entire piece	Oxide black; oiled	Enamel, rust-inhibiting, OD
		Nonbearing surfaces	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, OD
NUT, rd, 0.393–32NS–3 x 0.18 thk, 5320866.	39	Entire piece	Oxide black; lacquer, rust-inhibiting.	Enamel, rust-inhibiting, OD
	40	Exposed surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, OD
PIN, stght, chamfered, $\frac{1}{16}$ x ⅛, 544101	35	Exposed end	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
PIN, stght, ¼ x $1\frac{5}{16}$, 586557	41	Exposed ends	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
PIN, taper, No. 6/0 x ⅜ in, 544033	37	Exposed ends	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
PLATE, name, 7579581	40	Rim, blank and letters	Lacquer, spraying, clear	
		Recessed background		Filler, graduation, black
PLUG, 0.393–32NS–3 x $\frac{7}{64}$ thk, 5320871.	42	Exposed surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
PLUG, 0.468–40NS–3 x 0.12 thk, 5031378.	40	Exposed surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
PLUG, $\frac{15}{32}$–40NS–3 x $\frac{7}{32}$ overall, 5320867.	39	Exposed surface	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD

RETAINER, collimator, eyelens, 5043120.	38	----------	Oxide black	----------
RETAINER, collimator, mirror, 5320857.	36	Entire piece	Oxide black; lacquer; rust-inhibiting.	Enamel, rust-inhibiting, OD
		Nonbearing surfaces	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, OD
RETAINER, mounting latch bracket, 6270961.	40	Exposed surface but not engraved surface.	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
		Engraved surface	----------	Enamel, synthetic, gloss, black
		Engravings	----------	Filler, graduation, white
RETICLE, collimator, 5043119	38	Plated surface	----------	Varnish, shellac, bleached
SCREW, mach, fil-hd, No. 5–44NF–3 x ¼, 503868.	32 40	Top of head	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
SCREW, mach, fl-hd, No. 0–80NF–3 x ⅛, 503927.	36	Head and exposed end	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
SCREW, mach, rd-hd, No. 2–64NF–3 x 3/16, 504077.	39 40	Heads	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
SCREW, set, hdls, fl-pt. No. 2–64NF–3 x 3/32, 503880.	39 40	Top	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
SCREW, set, hdls, fl-pt, No. 5–44NF–3 x ⅛, 540883.	39 40	Top	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
SCREW, special, hdls, dog-pt, No. 5–44NF–3 x 0.17 overall, 5034659.	39 40	Top	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
SEPARATOR, collimator, 5035578	38	Entire piece	Oxide black	----------
SHAFT, collimator mirror, 5320861	37	Entire piece	Oxide black; oiled	Enamel, rust-inhibiting, OD
		Top and bottom	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, OD
SHOE, azimuth worm, 6270959	39	Exposed surface. Index area.	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
		Index		Enamel, synthetic, gloss, black Filler, graduation, white

Table VI. Surface Finishing of Sight M6—Continued

Assemblies and parts	Figure reference	Location	Surface treatment and intermediate coating	Top coat or final treatment
SPRING, compression, 0.047 diam stock, 0.325 OD, 8 coil, 5034447.	40	Entire piece	Zinc plate; bake	
SPRING, torsion, 0.063 diam stock, $\frac{37}{64}$ OD, 3½ coils, 5043139.	41	Entire piece	Zinc plate; bake	
WASHER, lock, light, No. 2, 582950	39 40	Exposed edges	Primer, enamel, synthetic, corrosion resisting.	Enamel, synthetic, gloss, black
WORM, elevating, 6270963	40	Entire piece	Chemical	

Table VII. Surface Treatment of Carrying Cases

Item	Figure reference	Location	Surface treatment and intermediate coatings	Top coat or final treatment
CASE, carrying, M46, 7689011	2	All exterior and interior metal surfaces.	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
CASE, carrying, M74, 7689066		All exterior and interior metal surfaces.	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD
CASE, carrying, M81, 7692951		All exterior and interior metal surfaces.	Primer, enamel, synthetic, corrosion resisting.	Enamel, rust-inhibiting, OD Enamel, synthetic, gloss, OD

Section II. DISASSEMBLY OF SIGHT M4

31. Removal of Collimator Assembly

a. Loosen and remove round nut, 5049985 with the improvised span screw driver (fig. 17). Press against the head of the screw with the index finger to keep the pin, located in the screw head, from jumping out of its slot and allowing the screw to turn.

Figure 17. Removing collimator assembly, C69998.

b. Push out the screw assembly, 6179845 (fig. 18).

c. Lift the collimator from the head.

32. Removal of Elevating Worm

a. Set the elevation scale at the center of its movement (65 degrees) to relieve strain on the stop while removing the retaining nut.

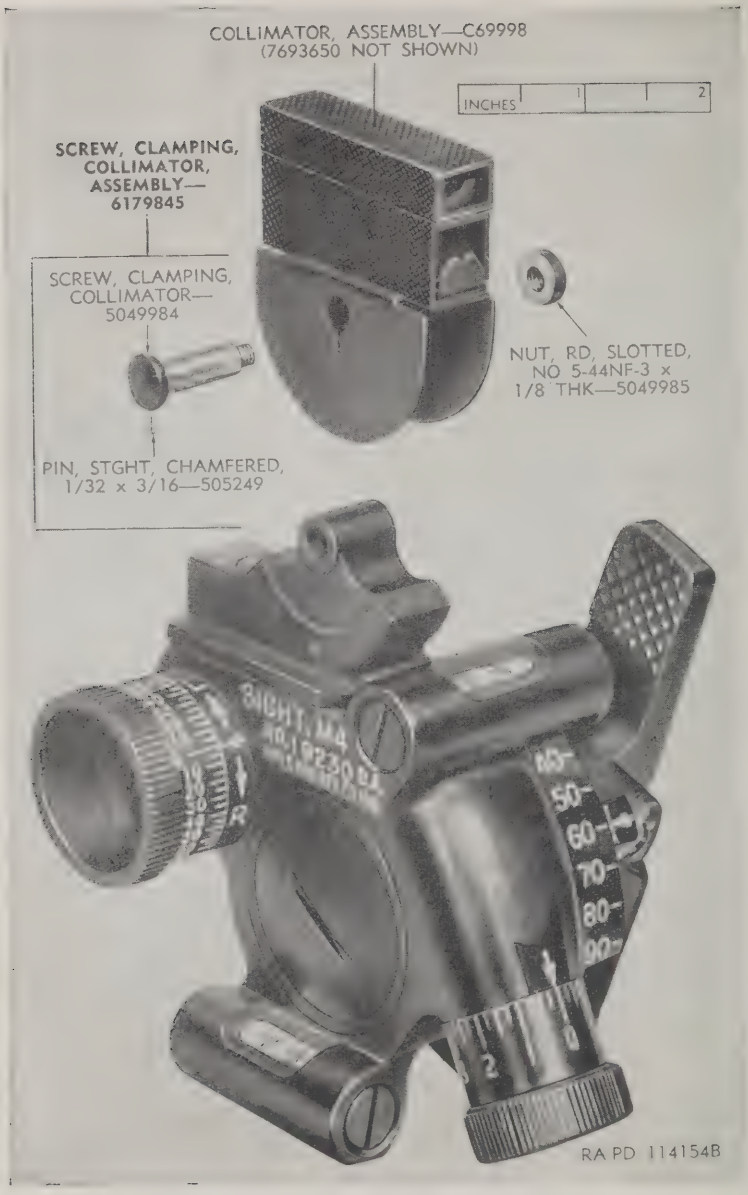

Figure 18. Collimator assembly, C69998 removed.

b. Remove the round nut with the adjustable face spanner wrench, 41–W–3248–125 (fig. 19) in one hand while holding the knob with the other hand to prevent the worm from turning.

Figure 19. Removing round nut from elevation micrometer adapter —sight M4.

c. Pull off knob and micrometer.

d. Examine the pin securing the adapter to the worm to determine the end of the pin with the smaller diameter. Drive out the pin (fig. 20) using a drift.

Caution: Be sure to support the adapter with a block to prevent the worm from bending. Install the round nut temporarily to protect the threads of the adapter.

Figure 20. Removing taper pin from elevation micrometer adapter —sight M4.

e. Pull or pry off the adapter.

f. Remove the washers, 5049973 and 5049974 (fig. 22).

g. Remove the set screw which secures the bushing in the housing.

h. Unscrew the bushing from the housing with the special tubular wrench, 41–W–3735–375 (fig. 21).

i. Remove the worm from the body by rotating the worm counterclockwise until it is free of the worm gear, and then pull it from the body.

j. Remove the washer from the worm (fig. 22).

Figure 21. Removing elevating worm bushing—sight M4.

33. Removal and Disassembly of Mounting Bracket Assembly

a. Remove the headless set screw from the elevation worm gear retaining screw (fig. 24).

b. Remove elevation worm gear retaining screw (with the special remover, 41–R–2373–125) from the bracket assembly. Do not allow the bracket assembly to fall out of the body until its position is marked.

c. Scribe a line across the worm gear and bracket assembly (fig. 23). The line is scribed to indicate position of gear and worm at time of disassembly; upon assembly, the gear will be repositioned for reason indicated in paragraph 53*h*.

d. Pull the bracket assembly with keys from the worm gear (fig. 24).

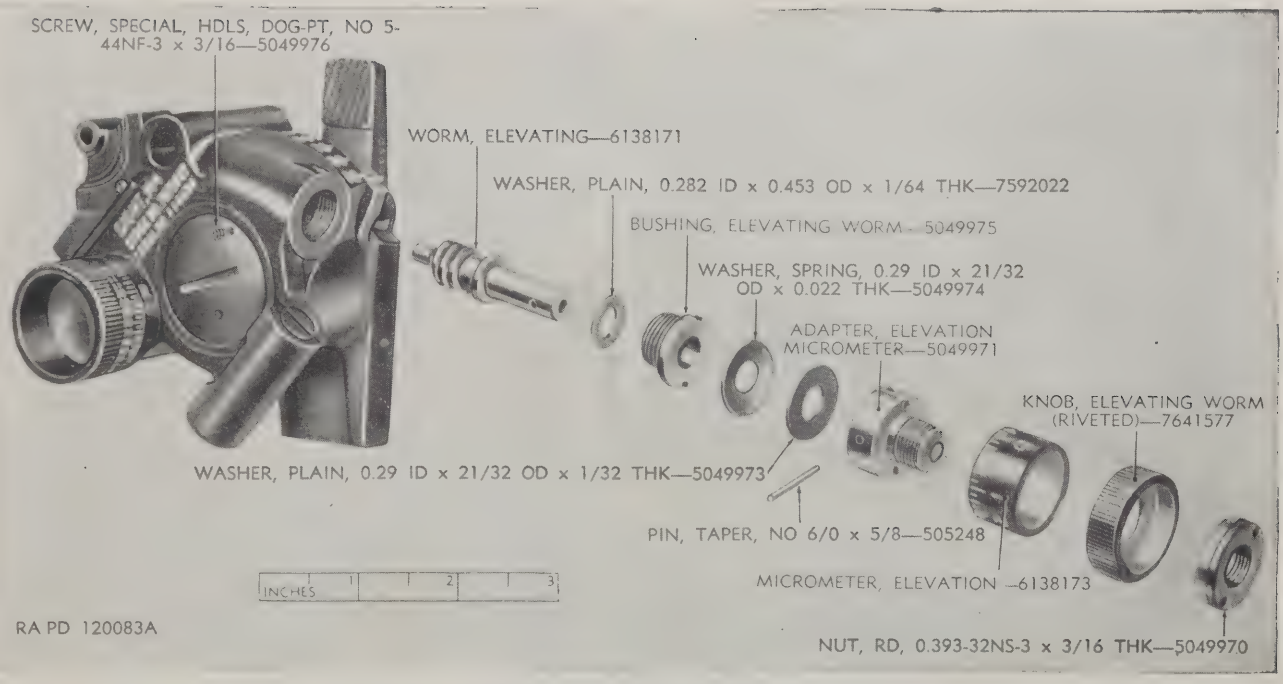
SCREW, SPECIAL, HDLS, DOG-PT, NO 5-44NF-3 x 3/16—5049976
WORM, ELEVATING—6138171
WASHER, PLAIN, 0.282 ID x 0.453 OD x 1/64 THK—7592022
BUSHING, ELEVATING WORM—5049975
WASHER, SPRING, 0.29 ID x 21/32 OD x 0.022 THK—5049974
ADAPTER, ELEVATION MICROMETER—5049971
KNOB, ELEVATING WORM (RIVETED)—7641577
WASHER, PLAIN, 0.29 ID x 21/32 OD x 1/32 THK—5049973
PIN, TAPER, NO 6/0 x 5/8—505248
MICROMETER, ELEVATION—6138173
NUT, RD, 0.393-32NS-3 x 3/16 THK—5049970
INCHES
RA PD 120083A

Figure 22. Elevating worm removed from body—sight M4.

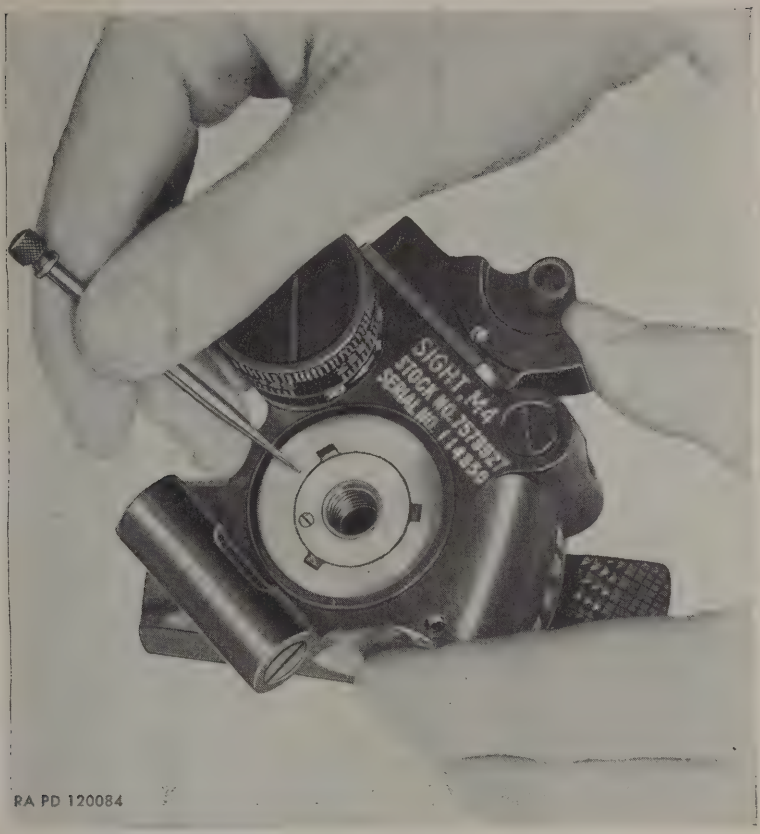

Figure 23. Placing identification marks on bracket assembly and elevation worm gear—sight M4.

e. Carefully pry out the keys with a screw driver. Remove the retaining ring and torsion spring from the bracket assembly.

f. Lift the worm gear from the body.

g. Remove special screw, 5049990 from bracket assembly (fig. 24). Inspect for cracks, bends, or excessive wear.

h. Drive out latch hinge pin with a drift.

i. Remove the mounting latch and torsion spring from the mounting bracket (fig. 25).

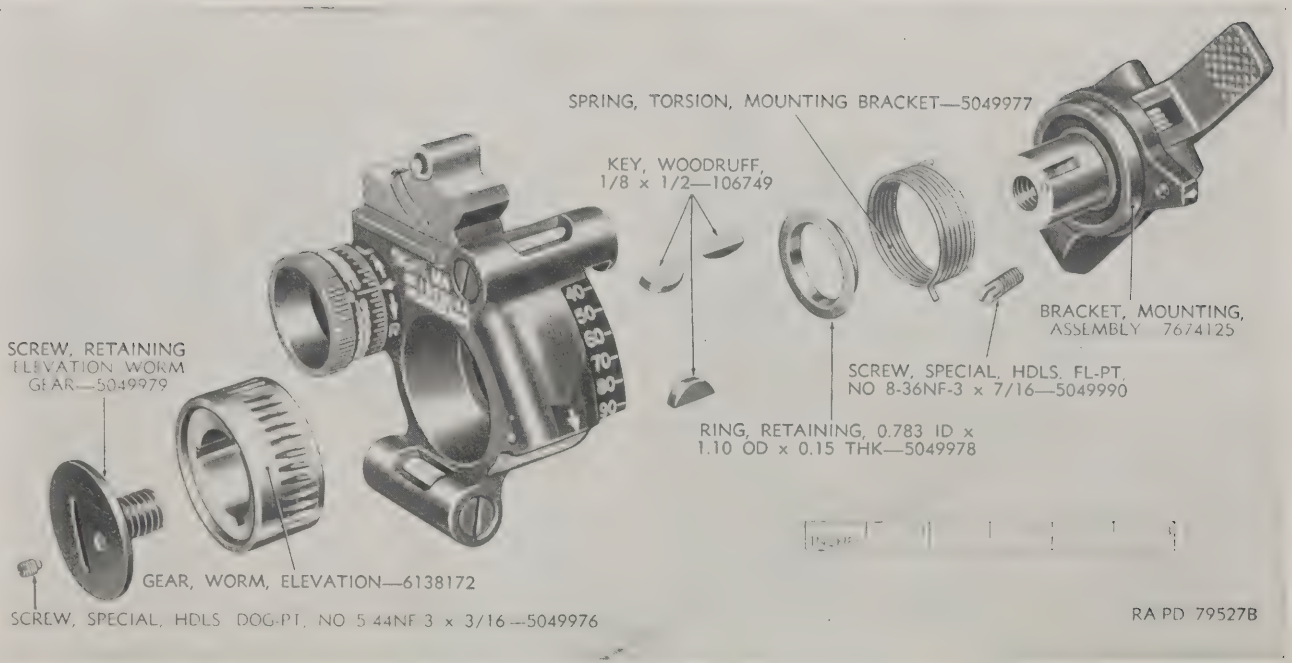
SPRING, TORSION, MOUNTING BRACKET—5049977
KEY, WOODRUFF, 1/8 x 1/2—106749
BRACKET, MOUNTING, ASSEMBLY 7674125
SCREW, RETAINING ELEVATION WORM GEAR—5049979
SCREW, SPECIAL, HDLS. FL-PT, NO 8-36NF-3 x 7/16—5049990
RING, RETAINING, 0.783 ID x 1.10 OD x 0.15 THK—5049978
GEAR, WORM, ELEVATION—6138172
SCREW, SPECIAL, HDLS DOG-PT, NO 5-44NF-3 x 3/16—5049976
RA PD 79527B

Figure 24. Mounting bracket assembly, 7674125 removed from body.

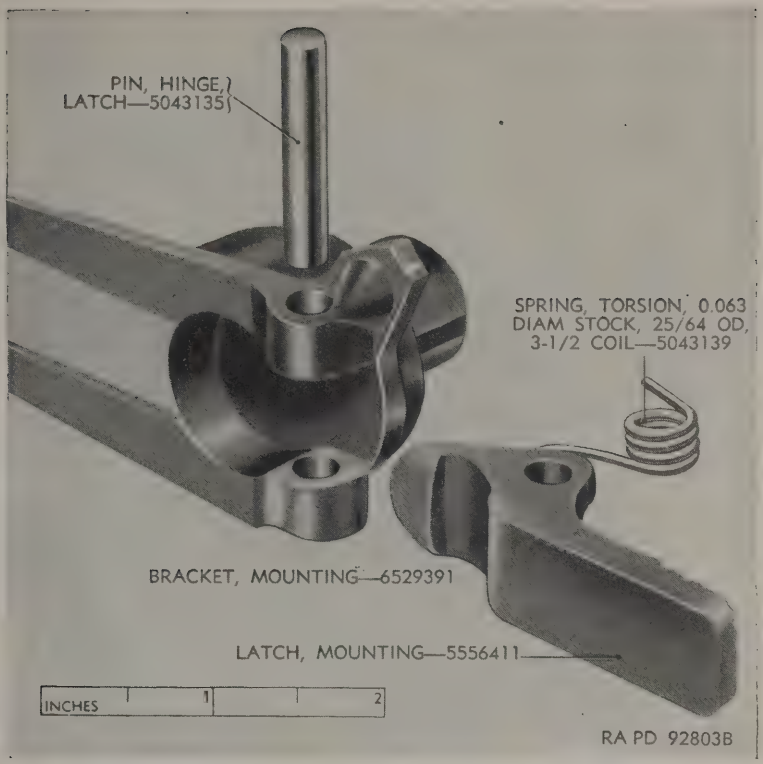

Figure 25. Mounting bracket assembly, 7674125—exploded view.

34. Removal of Deflection Screw

a. Turn the deflection screw to the end of its movement with the front of the head pivoted towards the deflection screw.

b. Remove the headless set screw from the end of the deflection retaining screw (fig. 26) and body.

c. Remove the deflection retaining screw (with the special remover, 41–R–2373–125) and washers.

d. Turn the deflection screw counterclockwise off the eccentric pin to remove it from the body.

e. Examine pin, 109576 for bends or excessive wear. If found unserviceable, drive out the pin with a drift and replace.

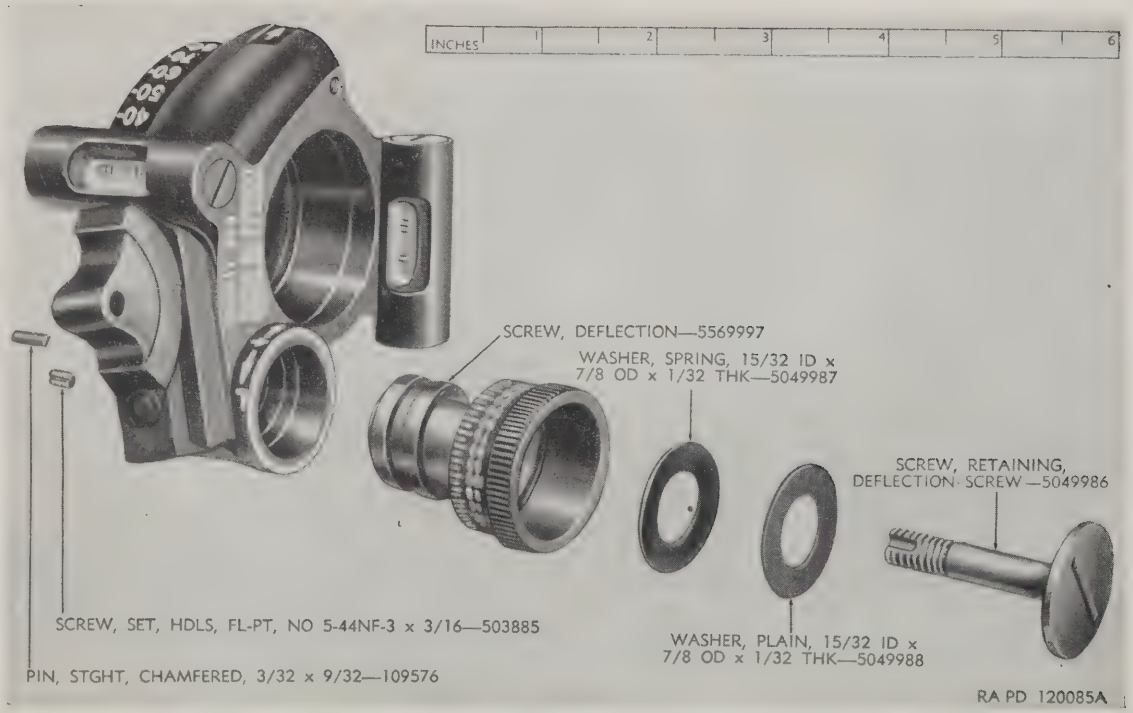

Figure 26. Deflection screw removed from body—sight M4.

35. Removal and Disassembly of Body Head

a. Support the head on a wooden block and drive out the straight pin that locks the body head to the body head pivot (fig. 27).

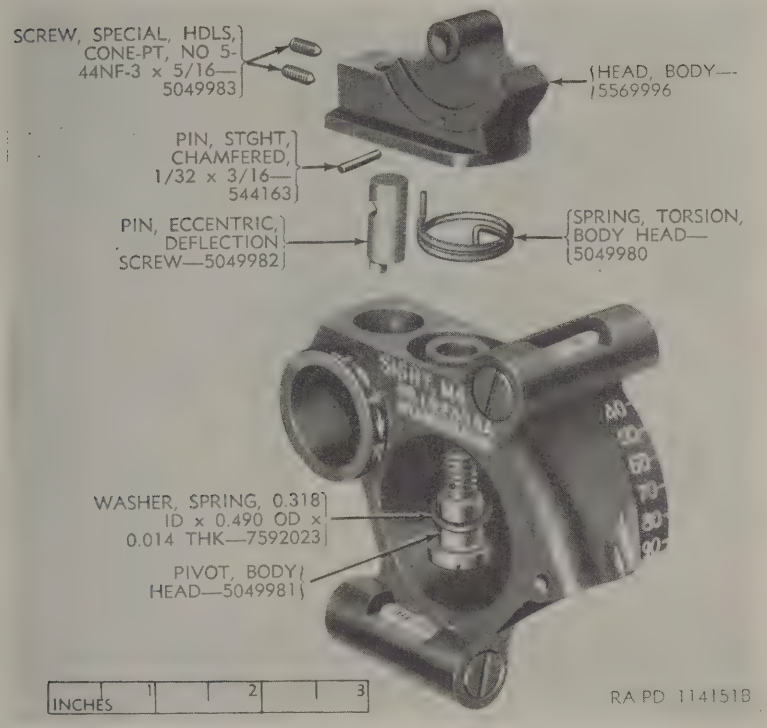

Figure 27. Body head removed from body—sight M4.

b. Unscrew the pivot, using an offset screw driver, 41–S–1410–25. Lift the head with the attached eccentric pin and adjusting screws from the body.

c. Remove the torsion spring from the body and the washer from the pivot (fig. 27).

d. Remove the two headless adjusting screws from the head.

e. Push the eccentric pin from the head.

36. Disassembly of Level Vials

a. Unscrew the plugs from the ends of the level vial housings. Remove level vials (fig. 28) only if the vial is broken or loose in the housing. If necessary, proceed as follows.

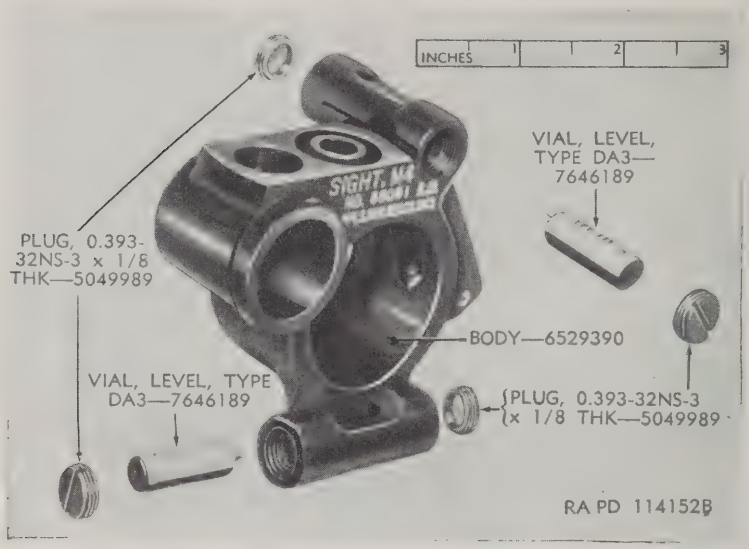

Figure 28. Level vials removed from body—sight M4.

b. Carefully remove the calcined gypsum from around the level vial, being careful not to damage the teat on the end of the vial. Use a pick or piece of shim stock to scrape and chip away all of the gypsum or broken glass.

c. Apply a small amount of fine oil around the vial to facilitate removal by lubricating those points which cannot be reached with a tool.

d. With a small dowel stick, the same diameter as the level vial, apply pressure on the flat end of the level vial to force it from its holder.

37. Disassembly of Collimator Assembly

The collimator assembly should be disassembled only to replace unserviceable parts, not to clean optics that can be cleaned on the outer surfaces without disassembly.

a. Collimator Assembly, C69998.

(1) Pry out the collimator eyelens retainer with a jeweler's screw driver (fig. 29). Straighten the crimped edge of the collimator tube with a pair of pliers.

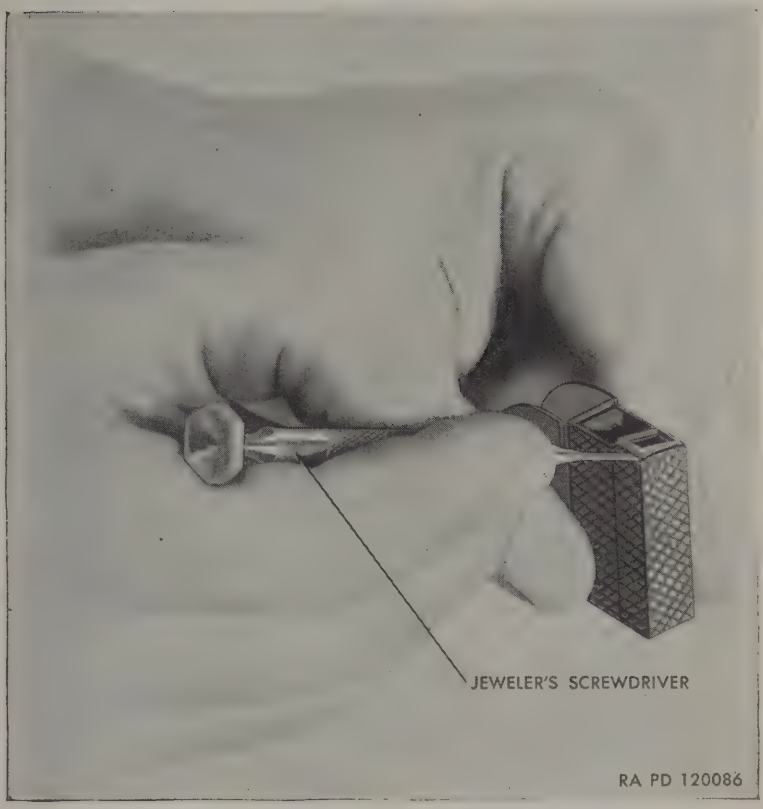

Figure 29. Removing eyelens retainer—collimator assembly, C69998.

(2) Push out the parts contained in the tube (fig. 30) through the eyepiece end, using a piece of wood covered with a cloth.

b. Collimator Assembly, 7693650.

(1) Pry out the retainer on the reticle end of the collimator body with a jeweler's screw driver. Straighten the crimped edge of the body with a pair of pliers.

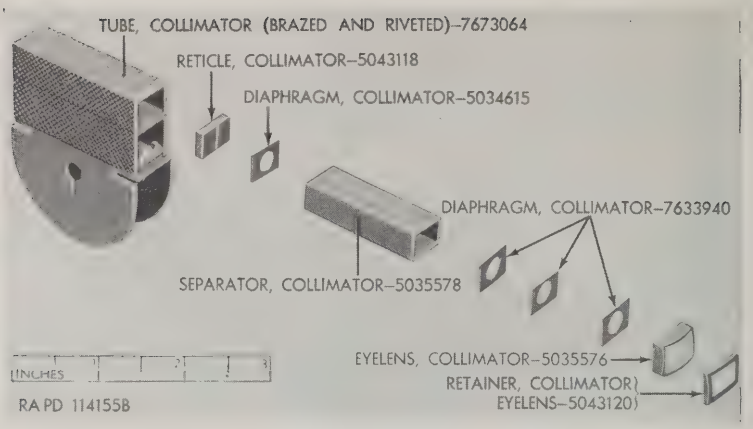

Figure 30. Collimator assembly, C69998 (alternate)—exploded view.

(2) Lift out retainers.

(3) Locate sealed holes, one on each side of the collimator body, that contain set screws that secure the holder in the body.

(4) Remove sealer from screw holes with a pointed tool.

(5) Unscrew the two set screws, 540963.

(6) Pull out the holder that contains the two reticles and the diaphragm.

(7) Remove reticles and diaphragm from holder.

(8) Lift crimped edge at eyelens end of collimator body with a jeweler's screw driver.

(9) Take out the retainer, eyelens, and diaphragms.

38. Removal of Worm Bushing

Inspect the steel worm bushing (this is bushing, 5178285 in the inside of the body) for serviceability. Test the fit with a new worm. If, when the new worm is inserted into the bushing, the fit is still sloppy, the bushing must be replaced. To remove the bushing, use a diamond point chisel to cut a groove in the bushing, which will release the side tension and allow the bushing to be pulled out.

Caution: Be careful not to cut through the bushing and into the body.

Section III. DISASSEMBLY OF SIGHT M6

39. Removal of Collimator with Mirror Assembly

a. Remove the four fillister-head machine screws which secure the collimator with the mirror assembly to the azimuth worm housing.

b. Lift the collimator with mirror assembly from the azimuth worm housing.

40. Removal of Azimuth Worm Housing Assembly

a. Remove the headless set screw that locks the round nut, 5320868.

b. Remove the round nut with adjustable face spanner wrench, 41–W–3248–125 (fig. 31).

Figure 31. Removing round nut from azimuth worm housing assembly —sight M6.

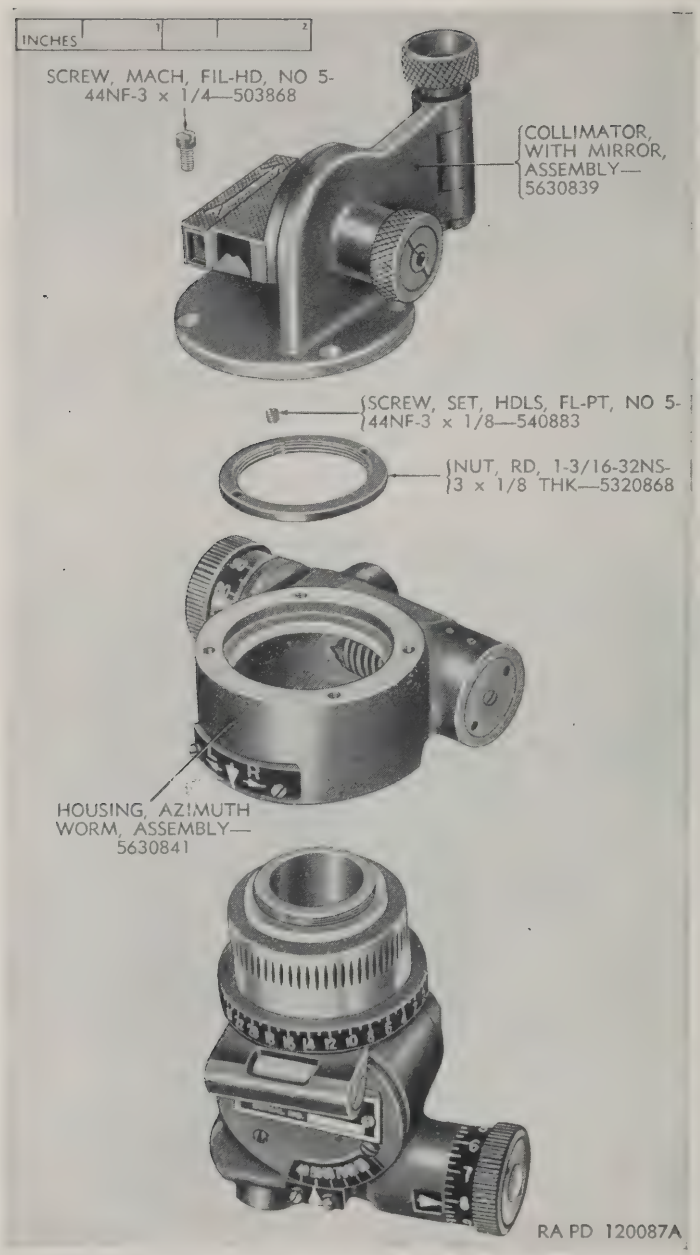
INCHES
SCREW, MACH, FIL-HD, NO 5-44NF-3 x 1/4—503868
COLLIMATOR, WITH MIRROR, ASSEMBLY—5630839
SCREW, SET, HDLS, FL-PT, NO 5-44NF-3 x 1/8—540883
NUT, RD, 1-3/16-32NS-3 x 1/8 THK—5320868
HOUSING, AZIMUTH WORM, ASSEMBLY—5630841
RA PD 120087A

Figure 32. Azimuth worm housing assembly, 5630841 removed.

c. Disengage the azimuth worm from its gear by pushing the azimuth micrometer forward and away from the housing (figs. 6 and 7). Hold it disengaged.

d. Lift the azimuth worm housing (fig. 32) off the main housing and release the micrometer.

41. Disassembly of Collimator with Mirror Assembly

a. Tighten the collimator locking knob with one hand and prevent the collimator from turning with the other hand (fig. 33). Tightening the knob will make the round nut more accessible for the 0.15-inch improvised span screw driver (A, fig. 13).

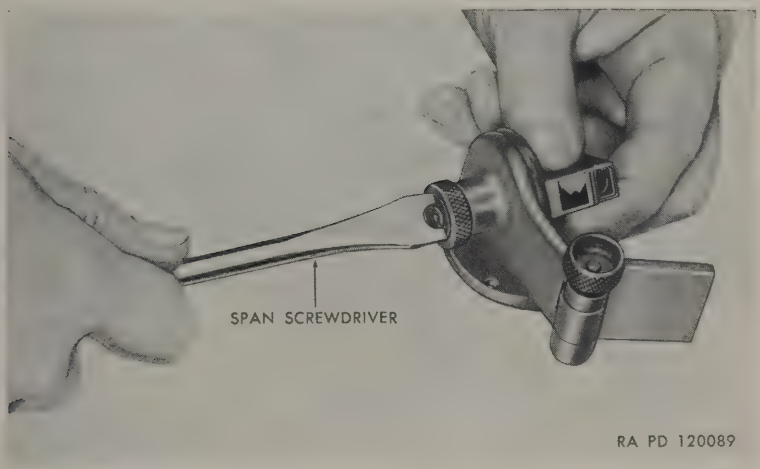

Figure 33. Removing round nut from collimator adapter—sight M6.

b. Hold the collimator from turning; remove the round nut (fig. 33) with the span screw driver (A, fig. 13). It may be necessary to cut away the staked metal with a diamond point chisel in order to remove the nut.

c. Remove knob with one hand while holding the collimator assembly from turning with the other hand.

d. Remove spring washer.

e. Pull adapter with attached collimator assembly from the bracket.

f. Remove the two flat-head machine screws which secure the collimator assembly to the adapter.

g. Pull collimator assembly from the recess in the adapter.

h. Remove the round nut that secures the shaft assembly, using the $^{3}/_{16}$ inch improvised span screw driver (B, fig. 13) while holding the shaft assembly from turning (fig. 34).

Figure 34. Removing round nut from shaft assembly—sight M6.

i. Unscrew the shaft assembly (counterclockwise) until it is free of round nut, 5320858. Lift the shaft assembly (fig. 35) out of the hinge.

j. Pull the mirror assembly free of the bracket.

k. Push the round nut free of the bracket.

l. Drive out the straight pin from the bracket.

m. Disassemble collimator mirror as follows:

(1) Remove the four flat-head machine screws which hold the collimator mirror and the two retainers to the collimator mirror holder (fig. 36).

(2) Separate the retainers and mirror from the holder.

n. Disassemble collimator mirror shaft as follows:

(1) Drive out the taper pin that secures the knob to the shaft (fig. 37).

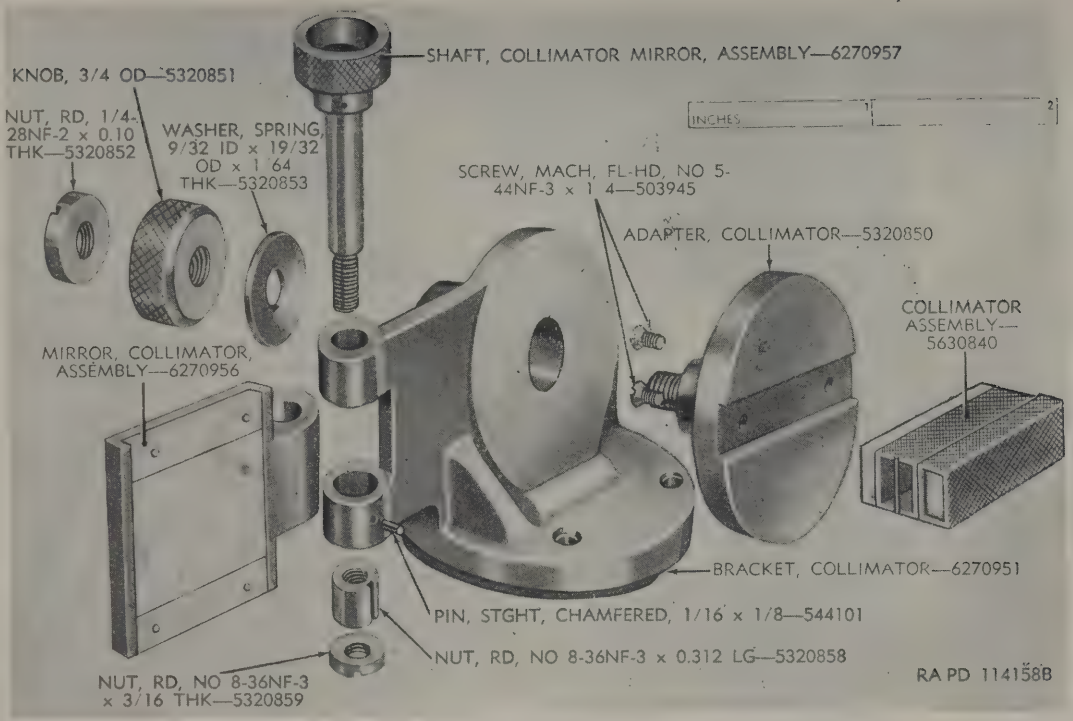
KNOB, 3/4 OD—5320851
NUT, RD, 1/4-28NF-2 x 0.10 THK—5320852
WASHER, SPRING, 9/32 ID x 19/32 OD x 1 64 THK—5320853
SHAFT, COLLIMATOR MIRROR, ASSEMBLY—6270957
INCHES
SCREW, MACH, FL-HD, NO 5-44NF-3 x 1 4—503945
ADAPTER, COLLIMATOR—5320850
COLLIMATOR ASSEMBLY—5630840
MIRROR, COLLIMATOR, ASSEMBLY—6270956
BRACKET, COLLIMATOR—6270951
PIN, STGHT, CHAMFERED, 1/16 x 1/8—544101
NUT, RD, NO 8-36NF-3 x 0.312 LG—5320858
NUT, RD, NO 8-36NF-3 x 3/16 THK—5320859
RA PD 1141588

Figure 35. Collimator with mirror assembly, 5630839—exploded view.

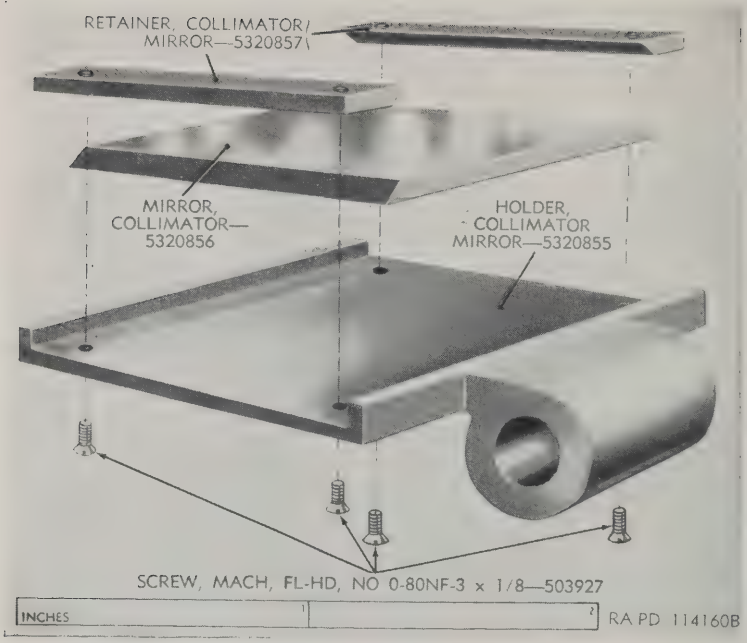

Figure 36. Collimator mirror assembly, 6270956—exploded view.

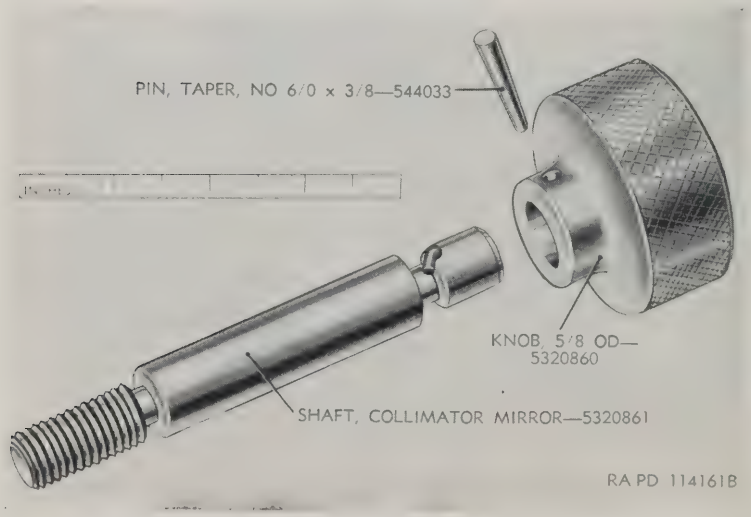

Figure 37. Collimator mirror shaft assembly, 6270957—exploded view.

(2) Separate the knob from the shaft.

o. Disassemble collimator as follows:

(1) Pry eyelens retainer from the collimator body with a jeweler's screw driver. Lift crimped edges with pliers.

(2) Push against reticle with a dowel stick covered with a cloth. The retainer, eyelens, diaphragms, separator, and reticle (fig. 38) will be forced from the body.

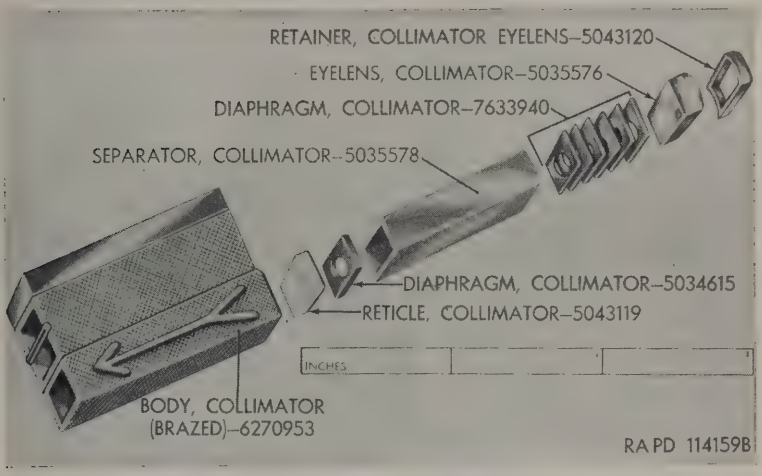

Figure 38. Collimator assembly, 5630840—exploded view.

42. Disassembly of Azimuth Worm Housing Assembly

a. Remove the round nut that secures the micrometer knob to the adapter (fig. 39), using an adjustable face spanner wrench, 41–W–3248–125 while keeping the worm from turning by holding the knob.

b. Pull the knob and micrometer from the assembly.

c. Drive the taper pin from the adapter.

d. Remove the adapter and shoe (fig. 39) from the worm shaft.

e. Remove the headless screw that locks the ball cap to the azimuth worm housing (fig. 39).

f. Unscrew the ball cap with an adjustable face spanner wrench, 41–W–3248–125.

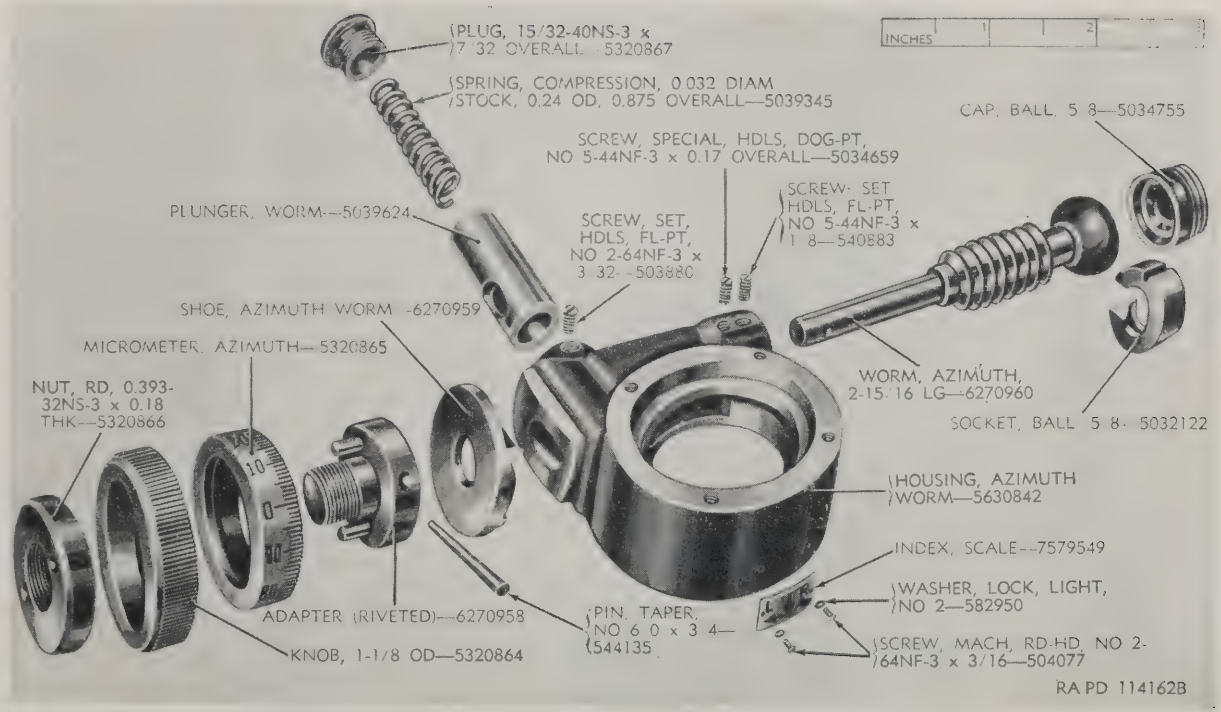
PLUG, 15/32-40NS-3 x 7/32 OVERALL—5320867
SPRING, COMPRESSION, 0.032 DIAM STOCK, 0.24 OD, 0.875 OVERALL—5039345
SCREW, SPECIAL, HDLS, DOG-PT, NO 5-44NF-3 x 0.17 OVERALL—5034659
CAP, BALL, 5/8—5034755
SCREW, SET, HDLS, FL-PT, NO 5-44NF-3 x 1/8—540883
PLUNGER, WORM—5039624
SCREW, SET, HDLS, FL-PT, NO 2-64NF-3 x 3/32—503880
SHOE, AZIMUTH WORM—6270959
MICROMETER, AZIMUTH—5320865
WORM, AZIMUTH, 2-15/16 LG—6270960
SOCKET, BALL 5/8—5032122
NUT, RD, 0.393-32NS-3 x 0.18 THK—5320866
HOUSING, AZIMUTH WORM—5630842
INDEX, SCALE—7579549
WASHER, LOCK, LIGHT, NO 2—582950
ADAPTER (RIVETED)—6270958
PIN, TAPER, NO 6 0 x 3/4—544135
SCREW, MACH, RD HD, NO 2-64NF-3 x 3/16—504077
KNOB, 1-1/8 OD—5320864
INCHES
RA PD 114162B

Figure 39. Azimuth worm housing assembly, 5630841—exploded view.

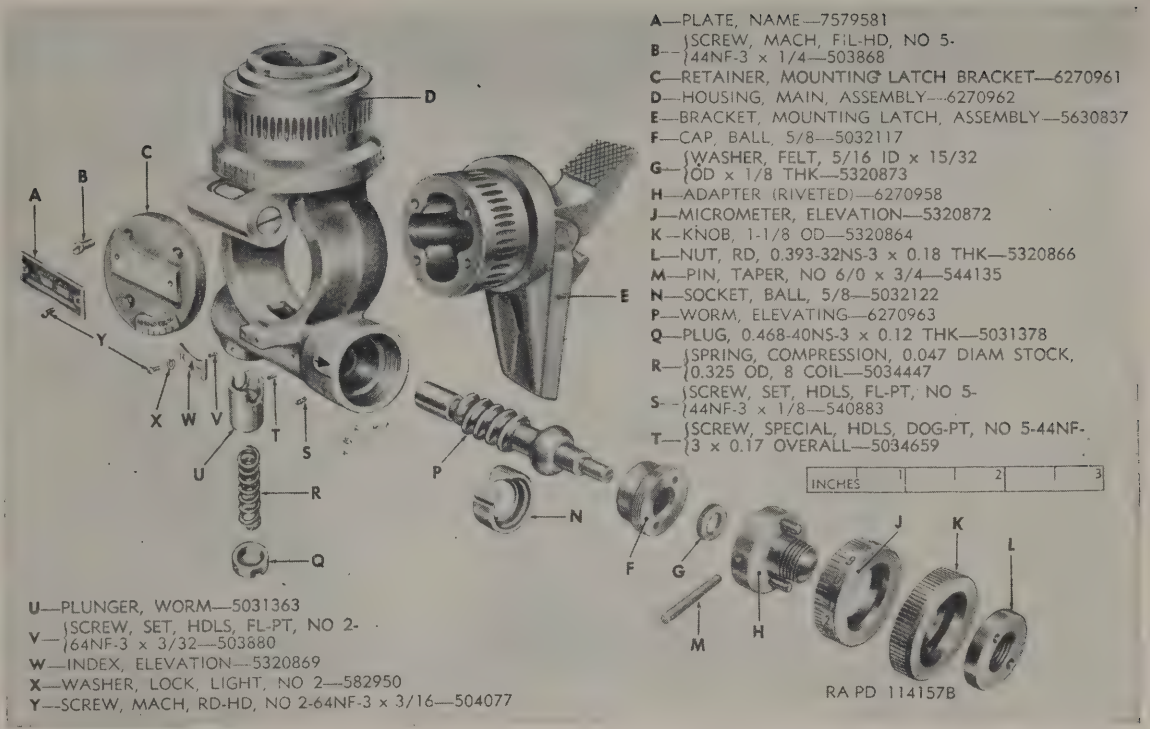
A—PLATE, NAME—7579581
B—SCREW, MACH, FIL-HD, NO 5-44NF-3 x 1/4—503868
C—RETAINER, MOUNTING LATCH BRACKET—6270961
D—HOUSING, MAIN, ASSEMBLY—6270962
E—BRACKET, MOUNTING LATCH, ASSEMBLY—5630837
F—CAP, BALL, 5/8—5032117
G—WASHER, FELT, 5/16 ID x 15/32 OD x 1/8 THK—5320873
H—ADAPTER (RIVETED)—6270958
J—MICROMETER, ELEVATION—5320872
K—KNOB, 1-1/8 OD—5320864
L—NUT, RD, 0.393-32NS-3 x 0.18 THK—5320866
M—PIN, TAPER, NO 6/0 x 3/4—544135
N—SOCKET, BALL, 5/8—5032122
P—WORM, ELEVATING—6270963
Q—PLUG, 0.468-40NS-3 x 0.12 THK—5031378
R—SPRING, COMPRESSION, 0.047 DIAM STOCK, 0.325 OD, 8 COIL—5034447
S—SCREW, SET, HDLS, FL-PT, NO 5-44NF-3 x 1/8—540883
T—SCREW, SPECIAL, HDLS, DOG-PT, NO 5-44NF-3 x 0.17 OVERALL—5034659
U—PLUNGER, WORM—5031363
V—SCREW, SET, HDLS, FL-PT, NO 2-64NF-3 x 3/32—503880
W—INDEX, ELEVATION—5320869
X—WASHER, LOCK, LIGHT, NO 2—582950
Y—SCREW, MACH, RD-HD, NO 2-64NF-3 x 3/16—504077
INCHES 1 2 3
RA PD 114157B

Figure 40. Elevating worm and mounting latch bracket assembly, 5630837 removed from main housing.

g. Remove the special headless screw that positions the ball socket in the azimuth worm housing.

h. Remove the headless set screw that secures the adjusting plug in the azimuth worm housing.

i. Unscrew the adjusting plug to release the tension on the compression spring.

j. Push the azimuth worm until the ball on the worm protrudes enough to grasp, then pull the worm from the housing.

k. Slip the ball socket from the worm.

l. Extract the spring and plunger from the housing.

m. Remove the two round-head machine screws and lock washers that secure the scale index to the azimuth worm housing (fig. 39).

43. Disassembly of Main Housing Assembly

a. Remove the round nut that secures the knob to the adapter (fig. 40).

b. Slide the knob and micrometer off the adapter.

c. Drive the taper pin from the adapter and remove the adapter and felt washer.

d. Remove the special headless screw and headless set screw that position the ball socket and lock the ball cap.

e. Unscrew the ball cap with an adjustable face spanner wrench, 41–W–3248–125.

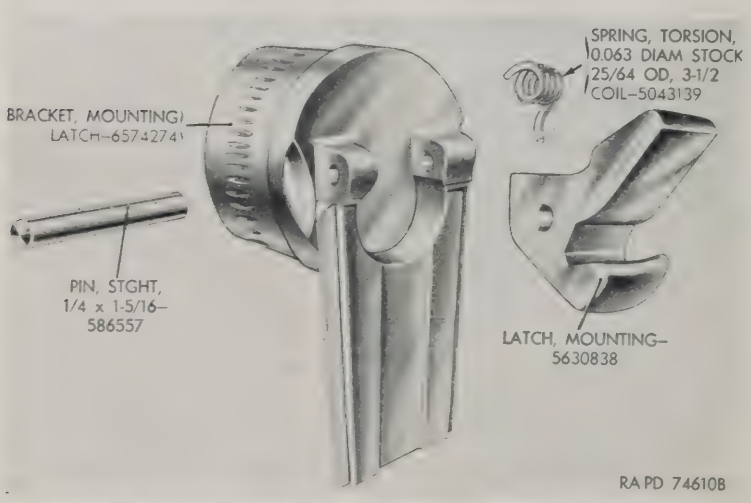

Figure 41. Mounting latch bracket assembly, 5630837—exploded view.

f. Remove the headless set screw that locks the adjusting plug, and unscrew the plug. Remove the compression spring and plunger.

g. The worm can now be removed by screwing it off the worm gear clockwise. The socket will come out with the worm.

h. Remove the four fillister-head machine screws from the mounting latch bracket retainer and remove the retainer (fig. 40).

i. The bracket assembly, of which the worm gear is a part, can now be removed from the housing.

j. Remove the two round-head machine screws that secure the name plate to the retainer, and lift off the plate.

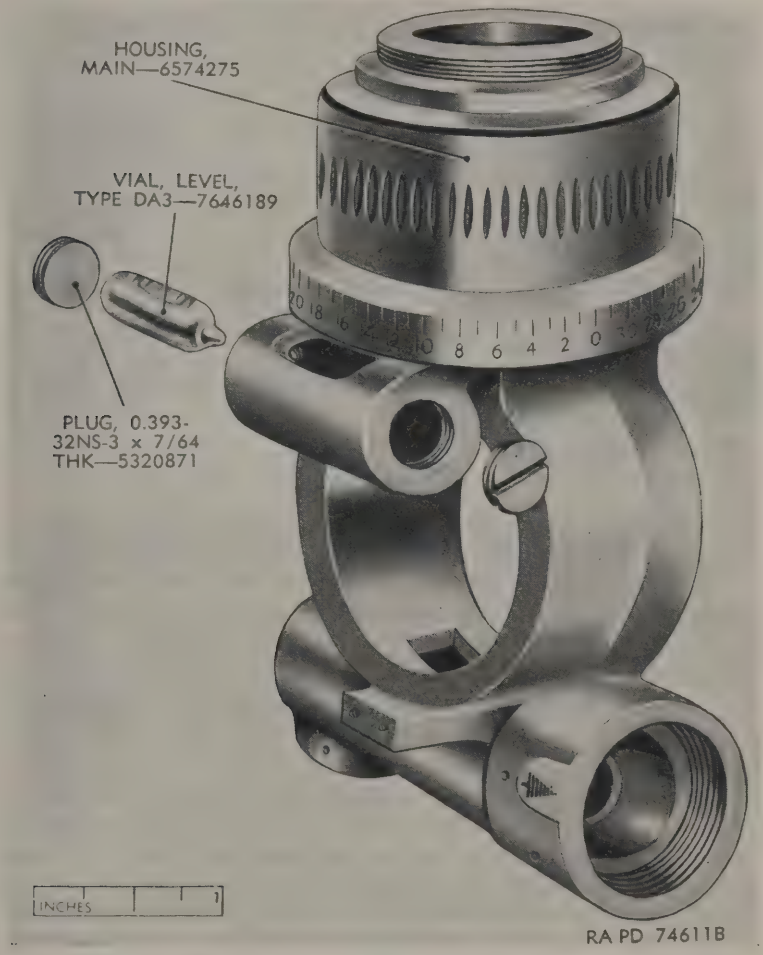

Figure 42. Level vial removed from main housing—sight M6.

k. Remove the two round-head machine screws and lock washers that secure the elevation index to the main housing and remove the index.

l. Disassemble the mounting latch bracket assembly by driving out the straight pin and removing the mounting latch and torsion spring (fig. 41).

m. Remove the longitudinal level vial (fig. 42), if necessary, as outlined in paragraph 36.

Section IV. REBUILD

44. Springs

When the sight is disassembled, the springs should be tested for serviceability. The springs should meet the specifications outlined in table VIII.

Table VIII. Spring Specifications

Item	How load is applied	Load readings
SPRING, 5049977 (M4)	Deflect 180 degrees from free position	5 lb ± ¾ lb
SPRING, 5049980 (M4)	Deflect 80 degrees from free position.	6 lb ± 1 lb
SPRING, 5034447 (M6)	Compress to 0.406 in.	12 lb ± 1 lb
SPRING, 5039345 (M6)	Compress to solid height	3¾ lb ± 0.4 lb

45. Backlash

If the allowable limits of backlash are exceeded (par. 23*g*(4) and (5)), as determined by inspection, the backlash is due to one or more causes. The repairman must investigate and determine which of the following is the cause for backlash and apply corrective action.

a. Looseness in Gear Meshes. A close mesh of the worm with the teeth of the worm gear is obtained by means of pressure against the worm shaft from a spring and plunger (M6) or a torsion spring (M4). If the teeth are not firmly in mesh, there may be rotation of the worm without corresponding movement of the worm gear. This condition for the sight M6 may be due to a weak plunger spring, which does not force the worm all the way in or which permits it to ride out instead of turning the worm gear. It may be due to burs or irregularities on the plunger or its housing, which does not permit the plunger to bear strongly on the worm shaft. This condition for the sight M4 may be due

to a weak torsion spring or binding in the movement, which results in the failure of the body to respond to small movements of the worm. Looseness in gear mesh may be due to the worm and worm gear being so badly worn that the worm shaft bears on its housing and the worm is thus prevented from meshing fully with the worm gear. Lost motion may also result from "bottoming," which prevents full mesh of the teeth. "Bottoming" is the condition that exists when the crests of the teeth of one member bear in the troughs of the other. Backlash due to looseness of mesh can be eliminated as follows:

(1) Replace the plunger springs or torsion springs if they are weak or, in an emergency, shim the plunger springs.

(2) Remove irregularities from the plunger that prevent its movement.

(3) Replace the worm and gear if worn badly or, in an emergency, file away or relieve the shaft housing if the shaft bears on it.

(4) Bottoming of the worm may be eliminated by turning off a small amount of metal from the worm, worm gear teeth, or both.

(5) Binding or uneven movement is usually caused by a bent worm, the presence of dirt between parts, or a bur on the teeth. If a bur is present, remove with a stone or file. Polish the area with crocus cloth, lubricate and assemble the parts, then check the movement. Check the worm in a lathe for straightness.

b. End Play. "End play" is the term applied to lengthwise movement of a shaft. End play is restricted by a shoulder and combination of torsion spring and spring washer on the sight M4 and by a ball cap and socket on the sight M6. If the cap is loose and the ball socket does not bear firmly and uniformly upon the ball, end play in the shaft will result. End play in the sight M4 elevation worm may result from weak springs or a bind, which relieves the torsion spring pressure and allows end play.

c. Side Play. "Side play" is the looseness or lateral movement that is found in improperly fitted or worn bearing parts. Lateral movement may be due to worm bushings in the sight M4. Worn plungers may cause side play in the sight M6. The plungers should be a lap fit in the housing. The semi-circular bearing surface of the plunger must not permit side play of the worm shaft. Before lapping in, it is advisable to relieve the center section of this bearing surface to prevent side play (fig. 43).

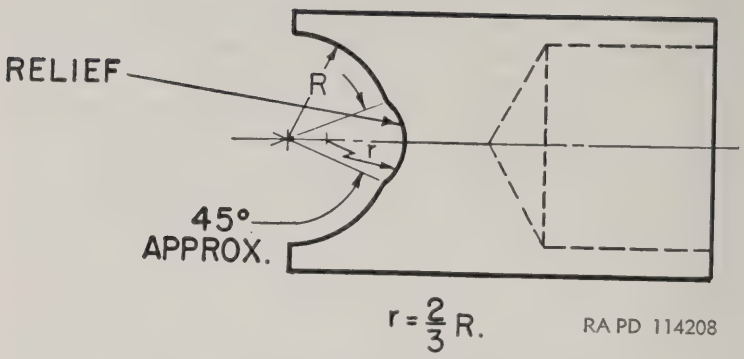

Figure 43. Plunger-showing bearing surface relief.

d. Backlash in the Deflection Movement of Sight M4. Backlash occurs in this screw type movement because elimination of backlash depends on a steady torsion spring pressure. When this spring pressure is relieved, backlash occurs. A bind, which will cause backlash, may be due to dirt between the head and the surface upon which the head pivots or a bur on the screw thread, eccentric pin, or on the mating surface of either the head or body. A weak or broken torsion spring will also produce backlash. Test the spring to see if it meets the specification of paragraph 44.

46. Holes Drilled at Assembly

a. General. Some holes are drilled and tapped at assembly after two parts have been adjusted. If one of these parts is replaced, the adjustment with the new part will require drilling the new part and possibly drilling a new hole in the old mating part.

b. Sight M4. Two pin holes and three screw holes of the sight M4 will require redrilling, if either of the mating parts that contain the screw or pin are replaced.

(1) Special screw, 5049976, which locks the elevation worm gear retaining screw, 5049979 to mounting bracket assembly, 7674125 (fig. 24), will require a new hole to be drilled in the bracket, if either a new bracket or retaining screw is used. Pull up on the retaining screw, 5049979 until all end play of the bracket assembly is eliminated. Through the hole in the new or old retaining screw, mark on the new or old bracket the position of the hole to be drilled. Disassemble the parts and drill a new hole in the bracket with a $^{3}/_{32}$-inch drill, $^{1}/_{16}$-inch deep. If a new retaining screw is installed and the position marked

on the bracket for the new hole falls too close to the old hole in the bracket, then another hole will have to be drilled through the retaining screw and into the bracket to assure positive locking of the parts. The retaining screw hole must then be tapped.

(2) Screw, 503885, which locks retaining screw, 5049986 (fig. 26) to the body, will require a new hole if either the body or the retaining screw are replaced. Pull up on the retaining screw until all end play between the body and the deflection screw is eliminated, then tighten a little more to compress the spring washer. Drill a new hole opposite the old hole with a 0.104 (No. 37)-inch drill, 1/4-inch deep and tap 1/8–44NF–3, 3/16-inch deep.

(3) Pivot, 5049981 (fig. 27) will require a hole for a pin, if it is installed new at assembly. Pull upon the pivot until all end play between the body and the head is eliminated, then tighten a little more to put tension on washer, 7592023. Through the hole in the side of the head, drill with a 0.055 (No. 54)-inch drill through the pivot.

(4) Pin 505248 (fig. 22), which secures the micrometer adapter to the worm, must have a new hole drilled for it at assembly, if either the worm or adapter or both were replaced. Place upon the worm, washer 7592022, bushing 5049975, spring washer 5049974, washer 5049973, and the micrometer adapter. Put this in a vise and tighten to compress the spring washer about half the compression distance. If both the worm and adapter are new, drill through both parts with a 0.063 (No. 52)-inch drill, using the drill point spot on the new adapter as a starting point. If only the adapter is new, drill through the adapter and the old worm in the same way, but the new hole in the worm should be 90 degrees from the old hole. When only the worm is new, drill into the worm through the hole in the adapter. Drill from the end of the hole of the adapter with the smaller diameter. Ream the hole for a No. 6/0 x 0.078 taper pin in all cases.

(5) Special screw 5049976 (fig. 22), which locks bushing 5049975 in place in the body, requires a hole drilled in the new bushing for the point of the screw. Pull up the bushing tight against the body. Through the hole in the body, mark on the bushing with a punch the location for the new hole. Remove the bushing from the body

and drill on this punch mark with a $^{3}/_{32}$-inch drill, $^{1}/_{16}$-inch deep.

c. Sight M6. Three pin holes and one screw hole will require redrilling, if either of the mating parts which contain the screw or pin are replaced.

(1) Pin 544135, which secures the adapter to the worm of both the elevation and azimuth mechanisms (figs. 39 and 40), will require a new hole for it after assembly, if either the adapter, the worm, or both are replaced. Make sure the ball cap and plunger spring are properly adjusted to eliminate end play. Push the new micrometer adapter on the new worm shaft as far as it will go and hold it snugly in place with a "C" clamp. Insert a 0.055 (No. 54)-inch drill in the hole in the adapter and drill through the worm and the other side of the adapter. Ream the hole for a No. 6/0 x 0.078 taper pin. If just the adapter has been replaced, drill into the side of the adapter requiring the hole through the hole in the adapter and worm. Ream the hole for a No. 6/0 x 0.078 pin, but make sure the hole in the worm (previously reamed) is properly alined. If just the worm is new, drill into the worm through the hole in the adapter. Drill from the end of the hole of the adapter with the smaller diameter. Ream for a 0.078 (No. 6/0)-inch pin.

(2) Screw 540883 (fig. 32), which locks the round nut 5320868 to the main housing, requires a new hole, if round nut is replaced. Pull up the round nut tightly against the main housing. Drill a hole into the housing and round nut with a 0.104 (No. 37)-inch drill, $^{5}/_{32}$-inch deep. Do not drill too close to the old hole. Tap $^{1}/_{8}$–44NF–3, $^{5}/_{32}$-inch deep.

(3) Taper pin 544033, which secures the mirror locking knob to the shaft, will require a new hole, if either the knob or shaft or both are replaced (fig. 37). Place the new knob on the new shaft and drill into the shaft through the hole in the knob with a 0.070 (No. 50)-inch drill. Ream for a No. 6/0 x 0.078 taper pin. If only the shaft is replaced, drill into the new shaft through the hole in the knob. Drill from the end of the hole of the smaller diameter. Ream for a No. 6/0 x 0.078 pin. If just the knob is replaced, drill through the hole in one side of the new knob and through the end of the hole in the shaft of the smaller diameter into the knob. Ream for a No. 6 0 x 0.78 pin but make sure to ream the shaft from the proper direction.

47. In-Process Inspection

Final acceptance of the assembled matériel depends largely upon the care exercised during the in-process inspection. Inspect all screws, nuts, bushings, caps, and plugs for crossed threads, turned corners, and damaged slots. Examine sliding surfaces and bearing surfaces for nicks and burs. Remove these burs with a fine mill file and polish with crocus cloth. Examine the collimator and determine if the end, which must be crimped over at assembly, is serviceable and will remain serviceable after being crimped over at assembly.

Section V. ASSEMBLY OF SIGHT M4

48. Replacing the Worm Bushing

The steel worm bushing must be replaced at this point, if it was found unserviceable. Press in the new bushing on an arbor press or place in position and drive it in with a drift and hammer.

49. Collimator Assembly C69998.

a. Insert the collimator reticle into the collimator tube (fig. 30) so the ground surface of the reticle enters the tube first.

b. Insert collimator diaphragm 5034615 into the collimator tube and push the diaphragm against the reticle by inserting and pushing the collimator separator into the tube.

c. Insert the same number of collimator diaphragms as were removed in disassembly. In the majority of cases, when a part is replaced in the collimator, the number of diaphragms needed to bring the reticle into focus will be the same as before disassembly.

d. Insert the collimator eyelens into the tube with the flat surface facing the diaphragms.

e. Push the collimator eyelens retainer into the tube with the curved surface facing the eyelens. If the reticle is not in focus as observed through the collimating telescope, add or take away diaphragms until the reticle is seen in sharp focus. Crimp over the tube edge, being careful not to scratch the eyelens.

50. Collimator Assembly 7693650

Note. The eyelens end of this collimator should be assembled last, because this is the end that will be adjusted for focus.

a. Insert into the reticle holder the phenolic diaphragm 7592239,

the metal reticle 7592244, and glass reticle 7592243 with the ground surface facing away from the metal reticle.

b. Position the holder with its parts in the collimator body. Insert the two No. 1 x $\frac{3}{32}$ cone-point headless set screws one on either side of the body and tighten temporarily to secure the reticle holder and parts in place. These set screws are used to adjust the line of sight of the collimator and the open sight for parallelism.

c. Insert two or more steel retainers 7592241 into the body so that the glass reticle is not loose enough to rattle and not so tight that it cannot be positioned with the headless set screws.

d. Crimp over the edge of the body to retain the holder in the body.

e. Insert the eyelens with the flat surface facing the brass diaphragms.

f. Insert two or more steel retainers as required to hold eyelens snugly.

g. After adjusting for focus as described in paragraph 49*e*, crimp over the edge of the body to secure the eyelens.

51. Body Head 5569996

a. Place the body head torsion spring in the groove in the top of the body (fig. 27). The bent-over end of the spring coil should be entered into the hole in the body.

b. Place the head on the top surface of the body with the bent-over end of the spring coil inserted into the hole provided in the head.

c. Insert the body head pivot with the spring washer 7592023 attached and screw it tightly into the head with an offset screw driver 41–S–1410–25. Back off on the pivot until the hole in the head and the hole in the pivot are alined. Refer to paragraph 46*b*(3) for instructions for installing a new pivot.

d. Install the straight pin in the body head (fig. 27).

e. Insert the deflection screw eccentric pin into the hole in the head. Aline the groove in the eccentric pin with the two screw holes in the front of the head. Support the eccentric pin in this position through the deflection screw opening.

f. Insert the two No. 5 x $\frac{5}{16}$ cone-point special screws (fig. 27) in the holes in the front of the head and turn up the screws approximately the same amount until they bottom in the groove of the eccentric pin.

52. Deflection Screw 5569997

a. Install the straight pin that acts as a stop for the deflection screw (fig. 26). Drive it into the body until it is flush with the outer surface of the body.

b. Push the deflection screw into the hole in the body and turn it clockwise to engage the eccentric pin in the body head; continue turning until stopped by straight pin.

c. Install the $^{15}/_{32}$ ID x $^{7}/_{8}$ OD x $^{1}/_{32}$ thick plain washer and the $^{15}/_{32}$ ID x $^{7}/_{8}$ OD x $^{1}/_{32}$ thick spring washer in that order on the deflection screw retaining screw. Install the retaining screw and washer. Refer to paragraph 46*b*(2) for instructions when installing a new retaining screw. Draw the screw up snugly until the groove in the screw alines with the groove in the body to form a hole for the set screw which locks the two parts together.

d. Install the No. 5 x $^{3}/_{16}$ flat-point headless set screw (fig. 26).

53. Mounting Bracket Assembly 7674125

a. Aline the torsion spring in position between the holes drilled in the mounting latch (fig. 25). The longer straightened portion of the spring should rest in the groove cut for it in the latch.

b. Hold the latch and spring in alinement for the latch hinge pin by overcoming the spring tension so the pin holes of the mounting bracket, latch, and spring are alined.

c. Install the latch hinge pin and stake at both ends.

d. Install the No. 8 x $^{7}/_{16}$ flat-point headless special screw in the mounting bracket assembly (fig. 24).

e. Install the mounting bracket torsion spring (fig. 24) into the cut-out section of the bracket assembly that is provided for it. The longer straight bent-over section of the spring should slip into a hole in the bracket.

f. Install the retaining ring with the flange facing the key slots (fig. 24). Place Woodruff keys in their slots. If the keys are not tight enough to stay in the grooves of the bracket assembly, apply some lubricating grease to the keys to make them stick in place.

g. Put the bracket assembly with spring, ring, and keys in place in the body. The bent-over end of the spring must be installed in the groove in the body.

h. Install the elevation worm gear in the body in a new position. Rotate the gear to a new position as indicated by the scribed line.

This puts a new set of teeth in mesh with the worm and eliminates backlash due to worn teeth.

i. Install elevation worm gear retaining screw (fig. 24) and tighten securely.

j. Back off on the retaining screw until the hole in the retaining screw and the hole in the mounting bracket are alined. Install the No. 5 x $^{3}/_{16}$ dog-point headless special screw. Refer to paragraph 46*b*(1) when installing this screw after a new bracket or retaining screw has been installed.

54. Elevating Worm

a. Place the elevating worm in mesh with the elevating worm gear and rotate the worm clockwise until it no longer advances into the body. The end of the worm must enter the bushing and travel into the bushing as the worm is rotated.

b. Install the plain washer (fig. 22) on the shaft of the worm.

c. Install elevating worm bushing and pull it up tightly with the tubular wrench 41–W–3735–375 shown in figure 21. Install the No. 5 x $^{3}/_{16}$ dog-point headless special screw that locks the bushing in position. Refer to paragraph 46*b*(5) for instructions when installing this screw after a new bushing has been installed.

d. Install the 0.29 ID x $^{21}/_{32}$ OD spring washer and the 0.29 ID x $^{21}/_{32}$ OD plain washer on the shaft of the worm (fig. 22).

e. Install the elevation micrometer adapter on the shaft of the worm and check the direction of taper in pin holes in both parts, then pin it in position with the No. 6/0 x $^{5}/_{8}$ taper pin. Install the round nut temporarily to keep the threads from being damaged.

Caution: Support the elevation micrometer adapter while driving in the taper pin (fig. 20).

Remove the round nut after the pin is installed. Refer to paragraph 46*b*(4) when installing the taper pin after a new worm or adapter has been installed.

f. Install the elevation micrometer, elevating worm knob, and the round nut (fig. 22). The micrometer should read zero when a graduation on the elevation scale is exactly alined with its index. When the micrometer is set to meet this condition (par. 62*c*), the round nut should be tightened securely with the adjustable face spanner wrench 41–W–3248–125 shown in figure 19.

55. Installing Collimator Assembly C69998 or 7693650

a. Place the collimator assembly astride of the head and aline the screw holes. The vertical wire of the open sight should be facing the front of the sight.

b. Install the $\frac{1}{32}$ x $\frac{3}{16}$ straight pin in the collimator clamping screw assembly (fig. 18).

c. Install the collimator clamping screw assembly so the head of the screw is on the side of the collimator bracket with the slot.

d. Install the No. 5 x $\frac{1}{8}$ slotted round nut and tighten with span screw driver (A, fig. 13) enough to assure that the collimator will not move from a set position except with firm pressure. Stake in two places to secure the nut.

56. Installing Longitudinal and/or Cross-Level Vials

a. Procedure Before Installing Longitudinal Level Vial. Place the sight in the sight fixture 41–F–299–25 (fig. 44) on a leveled surface plate. Set the elevation index on 60 degrees. Loosen the round nut on the elevation micrometer adapter with the adjustable face spanner wrench 41–W–3248–125 and slide the micrometer around until the index and the zero graduation are alined. Tighten the round nut and turn the micrometer until the "5" is opposite the micrometer index and the elevation index is mid-way between 40 and 50 degrees. The longitudinal level vial may now be installed.

b. Procedure Before Installing Cross-level Vial. Place the sight in the sight fixture 41–F–2994–25 on a cross-leveled surface plate. The cross level vial may now be installed.

c. Installing the Level Vial. Position the level vial in its housing with the graduations centered in the top opening of the housing. Carefully adjust the ends of vial with small wedges until the level bubble is centered.

Caution: Use care when installing wedges to avoid breaking the vial. The vial should be wedged to a snug position only.

After the vial is satisfactorily leveled, mix gypsum with water until a mixture about the consistency of heavy syrup is achieved. Seal the tube by pressing the gypsum in at both ends and around the graduation opening, taking extreme care not to move the vial. Check the position of the bubble at intervals while the gypsum is hardening. As the gypsum sets, the vial may change position slightly, thus requiring further adjustment. When the gypsum is dry, remove the excess from the graduation opening and from each end. Install the end plugs and stake.

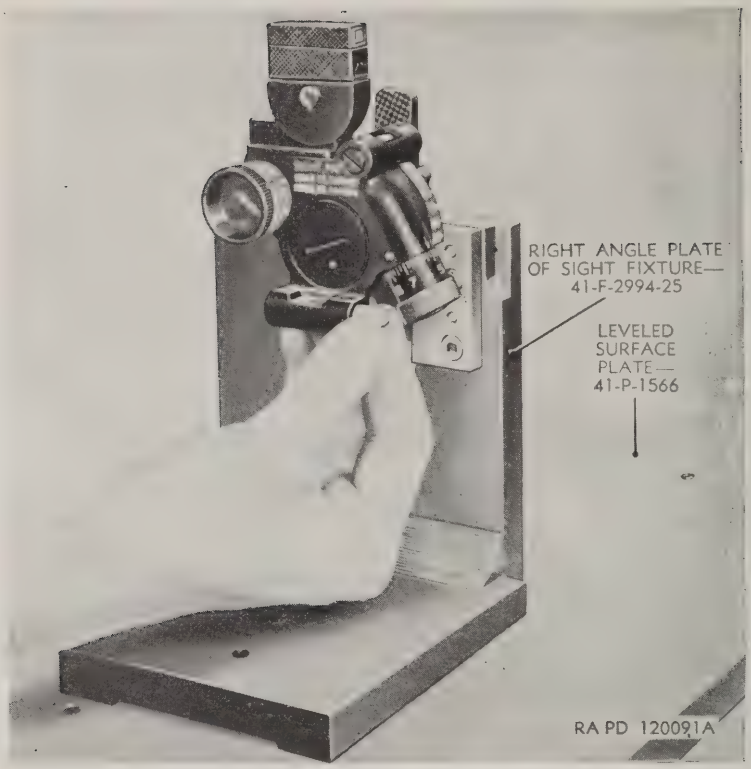

Figure 44. Installing longitudinal level vial—sight M4.

Section VI. ASSEMBLY OF SIGHT M6

57. Assembly of Main Housing Assembly

a. Follow the assembly directions of paragraph 53*a*, *b*, and *c* for assembling the mounting latch bracket assembly parts (fig. 41).

b. Insert the mounting latch bracket assembly into the main housing.

c. Install the name plate on the mounting latch bracket retainer with No. 2 x $\frac{3}{16}$ round-head machine screws (fig. 40).

d. Fasten the mounting latch bracket retainer to the mounting latch bracket assembly with the four No. 5 x $\frac{1}{4}$ fillister-head machine screws.

e. Install the elevation index in position on the main housing with the two No. 2 x $\frac{3}{16}$ round-head machine screws and No. 2 lock washers.

f. Install the ball socket on the elevating worm.

g. Insert the elevating worm (fig. 40) in the opening in the main housing and screw the worm counterclockwise to engage the worm gear. Screw the worm into the housing until the ball socket bottoms on the housing.

h. Position the socket by moving it with a pointed tool until the groove in the socket is opposite the screw hole in the housing. Install the No. 5 x 0.17 headless dog-point special screw.

Note. This screw only positions the ball socket and does not lock it in position.

i. Install the worm plunger in the opening in the bottom of the main housing, making sure that it seats on the shaft of the worm. Install the compression spring against the plunger and secure with the 0.468-inch diameter plug. Tighten the plug to increase the pressure on the compression spring. Install the No. 2 x $\frac{3}{32}$ flat-point headless set screw that secures the plug to the housing, but do not tighten until all the adjustments for backlash have been made.

j. Install the ball cap with adjustable face spanner wrench 41–W–3248–125 and tighten until all worm end play is eliminated. Install the No. 5 x $\frac{1}{8}$ flat-point headless set screw that locks the cap in the housing.

k. Install the $\frac{5}{16}$ ID x $1\frac{5}{32}$ OD felt washer on the worm.

l. Place adapter (fig. 40) on the worm and check the direction of taper in pin holes of both parts. Secure the adapter to the worm by driving the No. 6/0 x $\frac{3}{4}$ taper pin tightly into the adapter. Refer to paragraph 46*c*(1) when installing a taper pin after a new worm or adapter has been installed.

m. Install the elevation micrometer and $1\frac{1}{8}$-inch OD knob on the adapter and secure with the $1\frac{3}{16}$ x $\frac{1}{8}$ round nut. Use the adjustable face spanner wrench 41–W–3248–125 to tighten this nut.

58. Assembling and Installing Azimuth Worm Housing Assembly 5630841

a. Insert the worm plunger (hole alined to receive worm shaft) compression spring and $1\frac{5}{32}$ x $\frac{7}{32}$ plug (fig. 39). Install the No. 2 x $\frac{3}{32}$ flat-point headless set screw that secures the plug in the

housing, but do not tighten until the azimuth worm throw-out mechanism has been adjusted (*d* below).

b. Place the ball socket onto the azimuth worm and insert the worm into the housing, carefully passing the end of the shaft through the elongated hole in the worm plunger until the ball socket bottoms on the housing.

c. With a pointed tool, move the ball socket until the groove in the socket shows through the screw hole in the housing. Install the No. 5 x 0.17 dog-point headless special screw (fig. 39).

Note. This screw only positions the ball socket and does not lock it.

d. Install the ball cap and tighten with the adjustable face spanner wrench 41–W–3248–125 until all end play is eliminated. Install the No. 5 x 1/8 flat-point headless set screw that locks the ball cap in position.

e. Install azimuth worm shoe with the index pointing away from the body.

f. Install the adapter as described in paragraph 57*l*.

g. Install the azimuth micrometer and the knob onto the adapter and secure with the round nut in the same manner as described for the elevation in paragraph 57*m*.

h. Secure the scale index (fig. 39) to the azimuth worm housing with the two No. 2 x 3/16 round-head machine screws and No. 2 lock washers.

i. Place the azimuth worm housing assembly in position on top of the main housing (fig. 32). Push the azimuth micrometer toward the front to disengage the worm and gear and permit the azimuth housing to seat. Release the azimuth micrometer.

j. Install the 1 3/16 x 1/8 round nut (fig. 32) that secures the azimuth worm assembly to the main housing. Tighten this nut securely with the adjustable face spanner wrench 41–W–3248–125. Back off on the round nut until the hole in the main housing and the hole in the round nut are alined. Install the No. 5 x 1/8 flat-point headless set screw that locks the round nut to the main housing. Refer to paragraph 46*c*(2) for instructions when installing this set screw after a new round nut has been installed.

59. Installing Longitudinal Level Vial

Place the partially assembled sight in the sight fixture 41–F–2994–25 on a cross-leveled surface plate (fig. 45). Place a bench level across the top of the main housing. Center the bubble of the

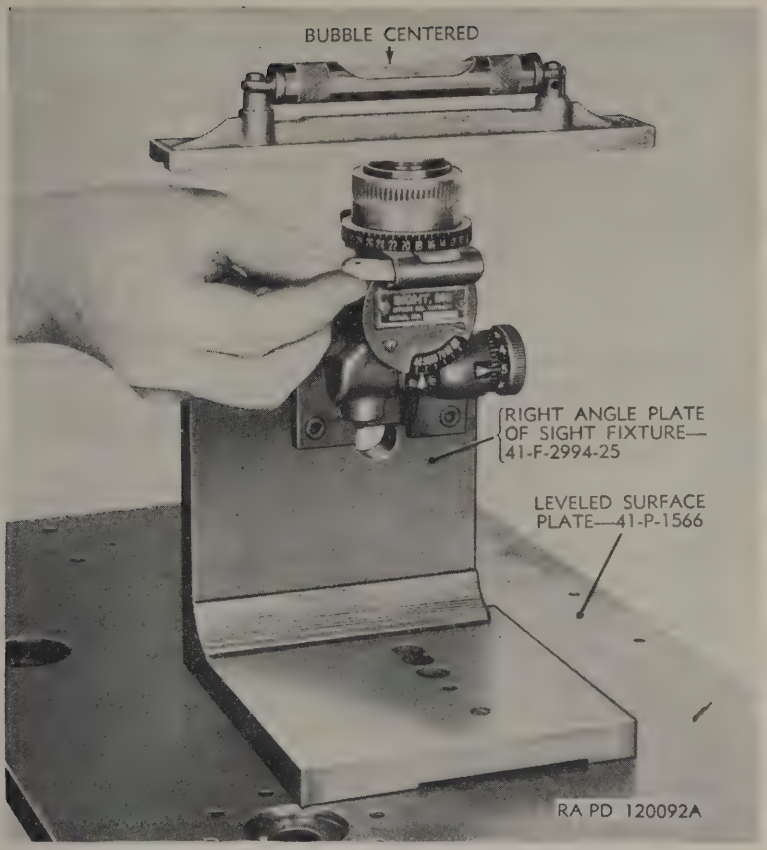

Figure 45. Installing longitudinal level vial—sight M6.

bench level by moving the elevation mechanism of the sight. When the bubble of the level is centered, the level vial may be installed according to paragraph 56*c*.

60. Assembly and Installation of Collimator with Mirror Assembly

a. Assembly of Collimator Assembly.

(1) Place collimator reticle (fig. 38) into the collimator body with the ground surface entering first.

(2) Put the fiber collimator diaphragm into the body.

(3) Push the collimator separator into the body. Add brass collimator diaphragms until proper focus is obtained (par. 49*c*).

(4) Insert the collimator eyelens with the flat surface entering the body first.

(5) Install the collimator eyelens retainer (fig. 38) and, when proper focus has been attained, the end of the body should be crimped over the retainer to hold the parts in the body.

b. Assembly of Collimator Mirror Assembly, 6270956.

(1) Secure one collimator mirror retainer in place on the collimator mirror holder with two No. 0 x 1/8 flat-head machine screws (fig. 36).

(2) Place the collimator mirror in place in the collimator mirror holder (fig. 36).

(3) Secure the second mirror retainer in position with the two No. 0 x 1/8 flat-head machine screws.

c. Assembly of Shaft Assembly.

(1) Place the knob on the collimator mirror shaft and aline the tapered pin holes in the proper position.

(2) Drive in No. 6/0 x 3/8 taper pin to secure the knob to the shaft (fig. 37). Refer to paragraph 46*c*(3) when installing a taper pin after a new shaft or knob has been installed.

d. Installing Collimator Assembly.

(1) Place the collimator assembly in the groove cut in the collimator adapter (fig. 35) with the holes alined with the screw holes in the adapter. Install the two No. 5 x 1/4 flat-head machine screws that secure the collimator assembly to the adapter (fig. 35).

(2) Put the adapter in position on the collimator bracket.

(3) Install the 9/32 ID x 19/32 OD spring washer, knob, and round nut on the adapter (fig. 35). Tighten the round nut with the improvised span screw driver (B, fig. 13) until one thread projects beyond the slotted face. Stake in two places to secure nut.

e. Installing Mirror Assembly.

(1) Install the 1/16 x 1/8 straight pin in lower hinge of the bracket (fig. 35).

(2) Aline the groove in the No. 8 x 0.312 round nut and the pin and insert the round nut into the lower hinge.

(3) Aline the hole in the mirror assembly holder and the holes in the hinges and insert and tighten the collimator mirror shaft assembly.

(4) Install the No. 8 x $\frac{3}{32}$ round nut on the end of the shaft assembly and tighten with the improvised span screw driver (A, fig. 13) until one thread projects beyond the slotted face of the nut. Stake in two places to secure the nut.

f. Mounting Collimator with Mirror Assembly, 5630839.

(1) Place the collimator with mirror assembly in position on top of the azimuth worm housing (fig. 32). Aline the four screw holes in the bracket with the holes in the worm housing.

(2) Install the four No. 5 x $\frac{1}{4}$ fillister-head machine screws that secure the collimator with mirror assembly to the azimuth worm housing.

Section VII. TEST AND ADJUSTMENT

61. Mounting the Sight for Tests Performed With the Leveling Fixture, 41–F–2994

Place the leveling fixture on a surface plate or stand in a position to observe a plumb line target. Level the leveling fixture, by adjusting the leveling screws of the surface plate or by using thin packing between the fixture and the stand. Place a bench level on the square shaft of the fixture, parallel to the axis of rotation, and adjust until the bubble of the level is centered. Now turn the level 90 degrees to the axis of rotation of the square shaft and center the bubble, by adjusting the screws of the leveling plate or by adding packing between the stand and the fixture. With a "C" clamp, attach the right angle plate of the sight fixture 41–F–2994–25 to the leveling fixture in an approximately level position (fig. 46). Place the perpendicularity gage in the socket of the right angle plate and place the bench level atop the gage parallel to the axis of rotation of the square shaft (fig. 47). Operate the cross-level worm until the bubble of the bench level is centered, then set the cross-level index of the leveling fixture (fig. 48) at zero without distrubing the level setting of the fixture. Turn the bench level on the gage 90 degrees to the axis of rotation of the square shaft (fig. 49) and operate the elevation worm of the leveling fixture until the level bubble is centered, then set the elevation index of the leveling fixture (fig. 48) at zero elevation without disturbing the level setting of the fixture. The leveling

fixture is now adapted for mounting the sights M4 and M6 for tests. Place sight M4 or M6 in the socket of the right angle plate (figs. 15 and 16).

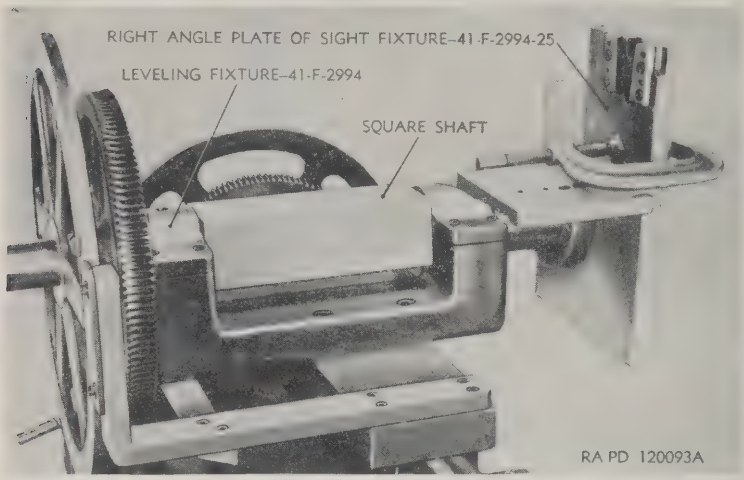

Figure 46. Installing the right angle plate of the sight fixture on the leveling fixture.

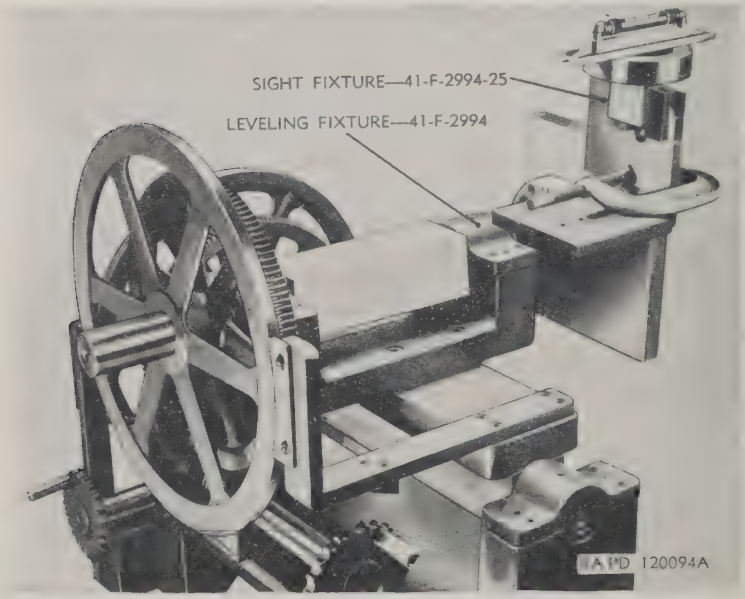

Figure 47. Preparation for adjusting cross-level index of leveling fixture.

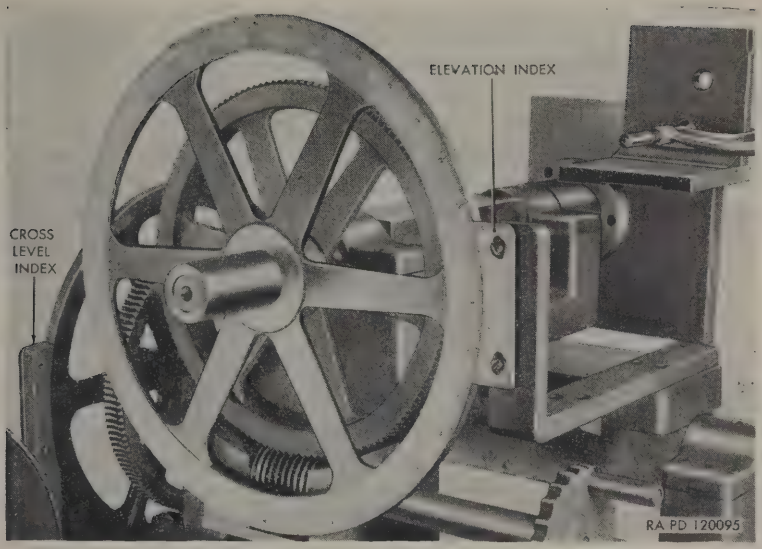

Figure 48. Elevation index and cross-level index of leveling fixture.

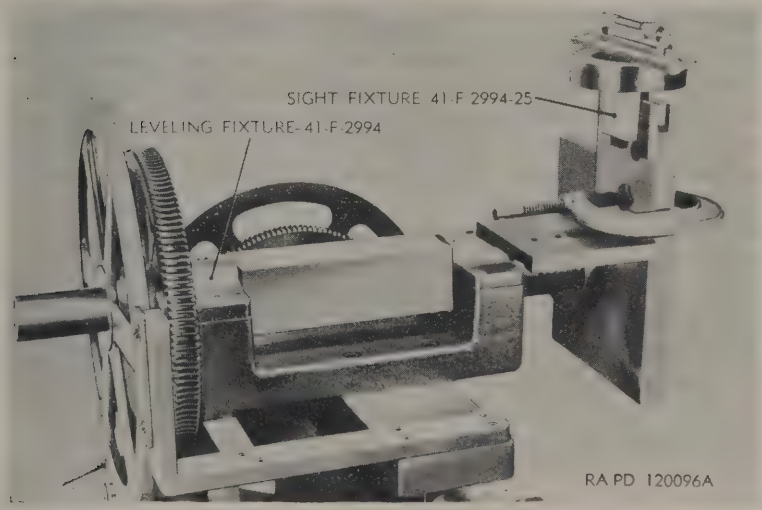

Figure 49. Preparation for adjusting elevation index of leveling fixture.

62. Tests Performed With the Leveling Fixture 41–F–2994

Mount the sight as described in paragraph 61. Where necessary, an amplified description of the tests of paragraph 23 appear as follows:

a. When the deflection micrometer of the sight MA reads zero or when the azimuth scale and micrometer of the sight M6 reads zero, the line of sight of the collimator should fall on the plumb line of the target within ± 1½ mils for the M4 and ± 3 mils for the M6 to meet the tests of paragraph 23c. If the micrometer reading does not fall within this tolerance, adjust the instrument according to paragraph 21*b*. The tolerance given is for the full field of view and is measured at one end of the collimator reticle line when the other end is in coincidence with the plumb line.

b. Check for parallelism of the plane of sight of the open sight with the plane of sight of the collimator. This check can be made against the plumb line by using all the points of the wire of the open sight to establish the complete plane of sight. With the deflection micrometer of the sight M4 set on zero, the plane of sight of the wire of the open sight can exceed the tolerance of parallelism given for the collimator sight by ± 5 mils. The tolerance given is for the full field of view and is measured at one end of the plane of sight of the wire of the open sight while the other end is in coincidence with the plumb line.

c. Test the accuracy of the elevation readings on the leveling fixture. Mount the sight as described in paragraph 61. With the leveling fixture set at zero elevation, the elevation level bubble is centered by means of the elevation knob of the sight. At this level setting, the elevation readings of the sight should be 45 degrees ± 10 minutes. To test the accuracy at other elevation readings, elevate the leveling fixture a given number of degrees. Center the longitudinal level bubble by turning the elevation knob. The reading on the elevation scale and micrometer of the sight should be 45 degrees plus the angle set on the leveling fixture. The difference between the actual reading on the sight and the leveling fixture reading plus 45 degrees is the error. Adjustment of the micrometer may be necessary for the sight M4. For the sight M6, both the elevation index and micrometer may need adjustment. Set the leveling fixture at 15 degrees elevation and center the longitudinal level bubble of the sight by means of the elevation knob. With an adjustable face spanner wrench 41–W–3248–125, loosen the round nut in the end of the elevation knob and slip the micrometer until the zero graduation is opposite its index. Tighten the nut and check to see that the micrometer has not slipped. No adjustment is provided for the elevation scale, but on the sight M6, the elevation scale index can be adjusted. With the leveling fixture and sight set as described above, loosen the two screws on the elevation scale index and slip it until it indicates 60 on the scale. Tighten the screws and check to see that the index has not slipped.

d. The longitudinal level can be used to indicate backlash in the elevation mechanism. Using the elevation knob, bring the longitudinal level bubble to the center of the vial. Be careful not to overpass the center. Note the reading on the scale and micrometer; then repeat the test by bringing the level bubble back to the center from the opposite direction, again being careful not to overpass the center and again noting the readings on the scale and micrometer. Any difference in readings is the amount of backlash (par. 23*g*(4)).

63. Establishing a Plumb Line Target

Mount a sight on the right angle plate of the sight fixture 41–F–2994–25 (fig. 50 and par. 61) and establish a plumb line target in line with the collimator sight and in a vertical plane that is 90 degrees to the axis of rotation of the square shaft. The plumb line is established by means of the collimating telescope 18–T–540–250 placed against the reference surface of the sight fixture 41–F–2994–25 (figs. 50 and 52). Mark on the target the point of intersection of the collimating telescope optical line of sight. Raise the "V" block 41–B–1472–100 and telescope to a new position (fig. 51) and mark again on the target the point of intersection of the telescope optical line of sight. Connect these two points on the target by a line. Lay a square against the flat surface (reference surface) of the right angle plate and measure the horizontal distance from the longitudinal axis of the sight collimator to the reference surface. Measure the horizontal distance from the longitudinal axis of the collimating telescope to the reference surface. Add the two measurements and, using this distance, establish the plumb line to the left of the line joining the points of intersection on the target of the telescope optical line of sight. To assist the inspector in performing the tests, the target should have a horizontal line with mil graduations on both sides and a plumb line with mil graduations on both sides to indicate allowable tolerances. The graduations on the target can be established by means of an engineer's transit or, knowing the exact distance from the axis of deflection the spacings can be calculated by rotation on the instrument to the target.

64. Mounting the Sights for Tests Performed on the Azimuth Testing Fixture, 41–F–2995

Place the bench level on the testing fixture and level the fixture with the leveling screws until the bubble of the bench level remains stationary while the fixture is rotated 360 degrees. Secure the right angle plate of the sight fixture 41–F–2994–25 on the azimuth

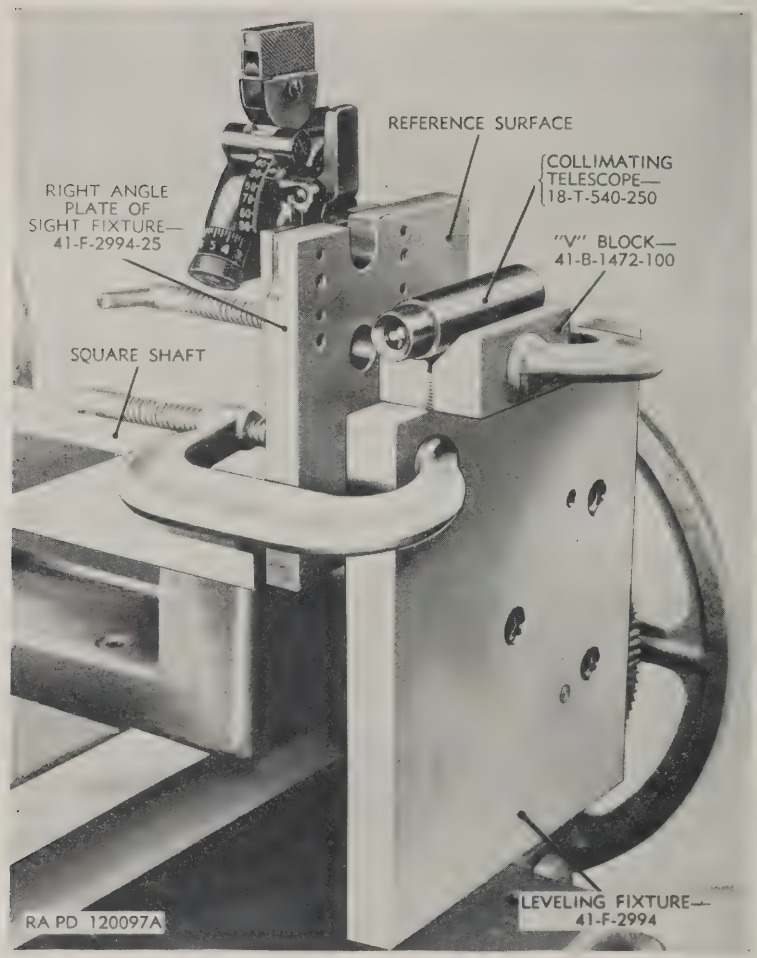

Figure 50. First step in establishing a plumb line target for sight M4.

testing fixture (fig. 53). Insert the perpendicularity gage and place the sensitive bench level atop the gage (fig. 54). The level bubble should remain stationary when the fixture is rotated 360 degrees. It may be necessary to adjust the right angle plate to the vertical position by using very thin packing between it and the testing fixture. Insert the sight into the slot of the right angle plate. The testing fixture is now adapted to perform tests.

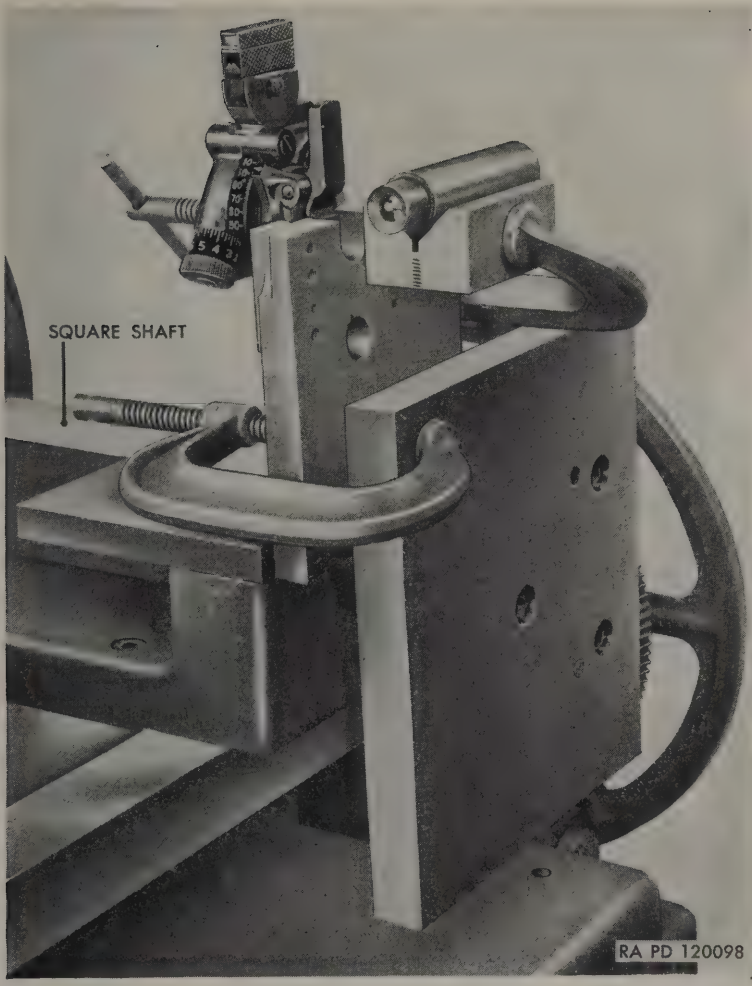

Figure 51. Second step in establishing a plumb line target for sight M4.

65. Test Performed With the Azimuth Testing Fixture 41–F–2995

Mount the sight as described in paragraph 64 (figs. 55 and 56).

a. Accuracy of deflection or azimuth readings is determined with the azimuth testing fixture. With the sight mounted on the azimuth testing fixture, the deflection or azimuth scale of the sight is set on zero. Bring the line of sight of the collimator into coinci-

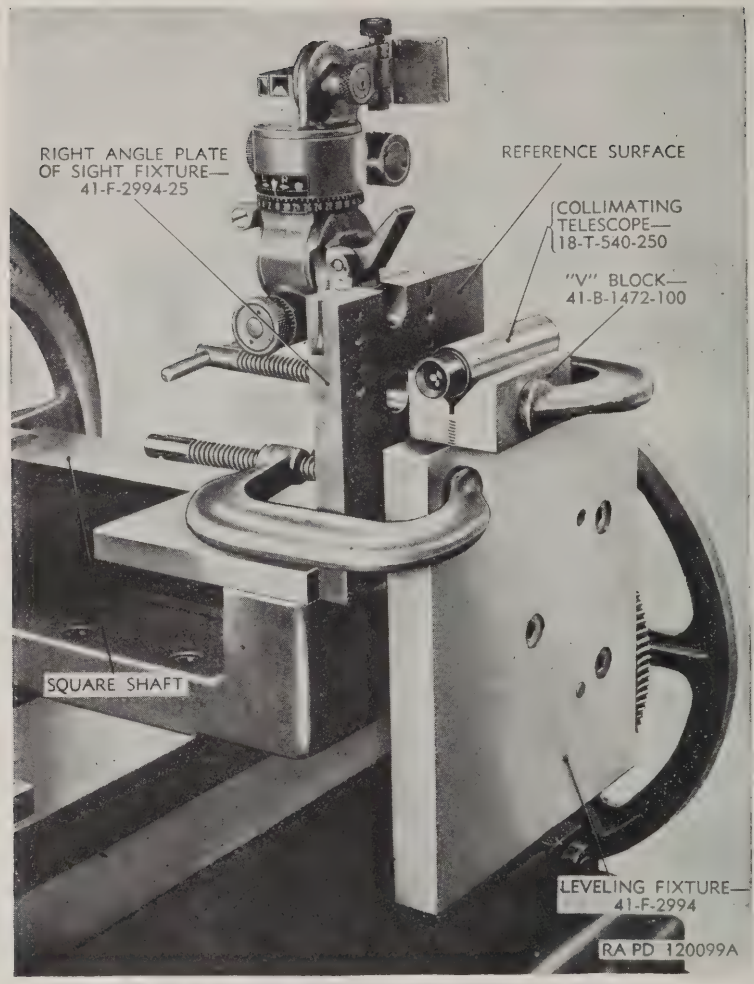

Figure 52. Establishing a plumb line target for sight M6.

dence with an established plumb line by means of the azimuth testing fixture and then set the azimuth scale index of the fixture at zero. Displace the line of sight from the plumb line by making a setting on the deflection or azimuth micrometer of the sight and then bring the line of sight back to the plumb line by means of the testing fixture. The difference in the value of the angle set off by the sight and the angle set off by the testing fixture in

Figure 53. Sight fixture, 41–F–2994–25 installed on azimuth testing fixture.

bringing the line of sight back into coincidence with the plumb line will be the error (par. 23*g*(3)).

b. Backlash in the deflection or azimuth mechanism can be determined by use of the plumb line or, when checking in the field, use any distant vertical line. Using the deflection or azimuth knob bring the line of sight of the collimator onto the plumb line. Be careful not to overpass the plumb line. Note the reading on the scale and micrometer; then repeat the test by bringing the collimator line of sight back to the plumb line from the opposite direction, again being careful not to overpass the plumb line and again noting the readings on the micrometer and scale. Any difference in readings is the amount of backlash (par. 23*g*(5)).

c. Vertical displacement of the line of sight can be checked on the sight M6 by performing a test similar to *a* above. Mount the sight on the azimuth testing fixture (fig. 56) as described in

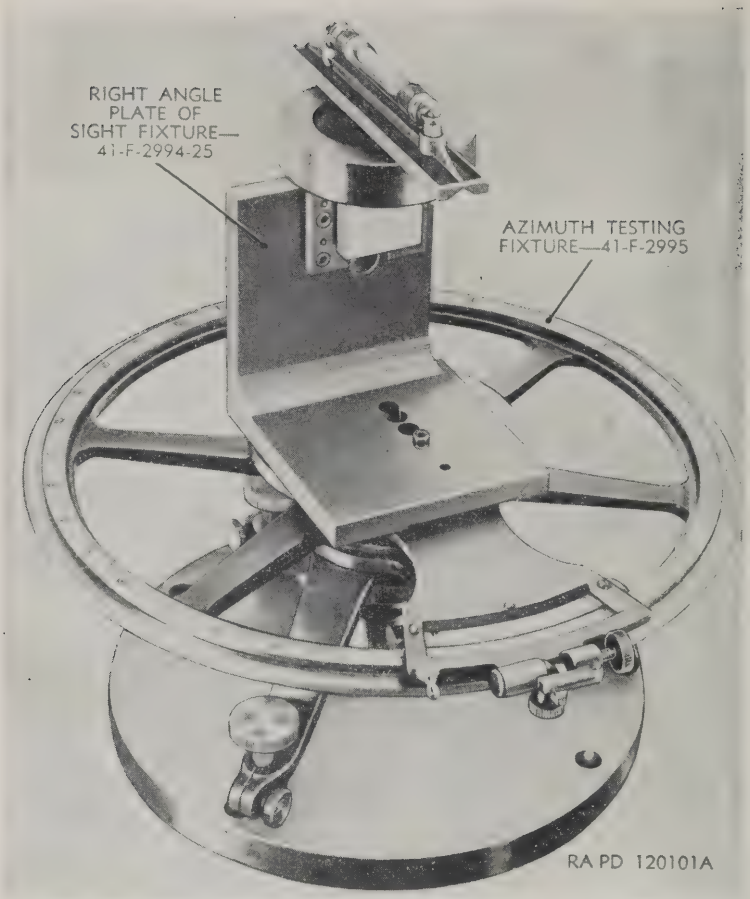

Figure 54. Preparations for check on verticality of right angle plate.

paragraph 64. Set the azimuth scale of the sight at zero. Bring the line of sight of the collimator into coincidence with an established plumb line by means of the azimuth testing fixture and then set the azimuth scale index of the fixture at zero. Place one end of the reticle line on the horizontal line of the plumb line target. Displace the line of sight from the plumb line by making a setting on the azimuth micrometer of the sight and then bring the line of sight back to the plumb line by means of the testing fixture. The end of the reticle line should fall on the horizontal line within one-half mil. Continue checking at intervals along the azimuth scale until the sight has been rotated one complete revolution.

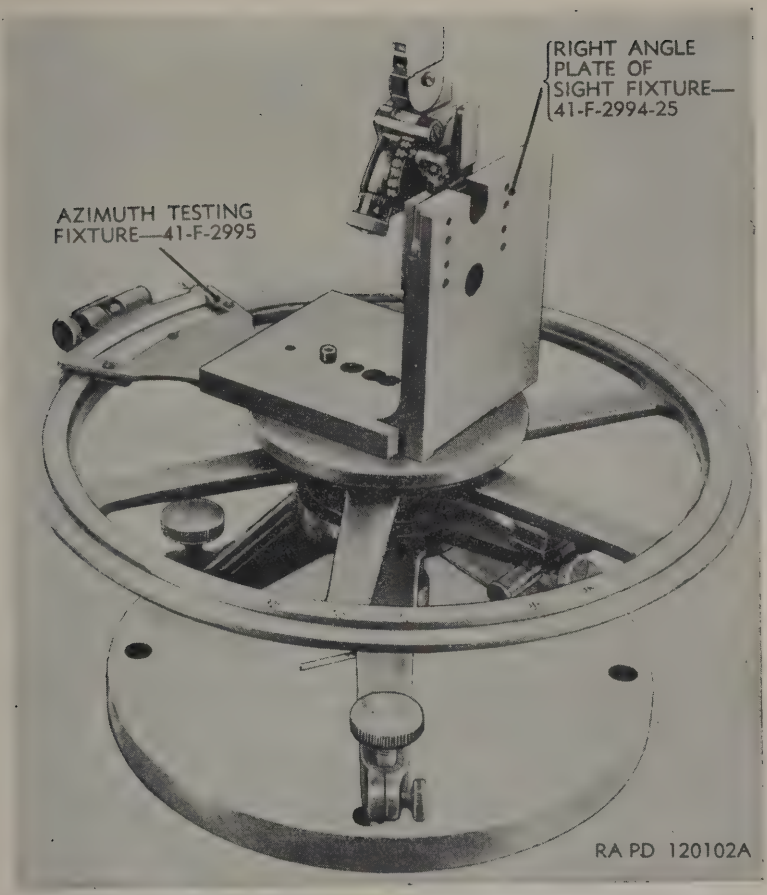

Figure 55. Sight M4 mounted for accuracy test of deflection mechanism.

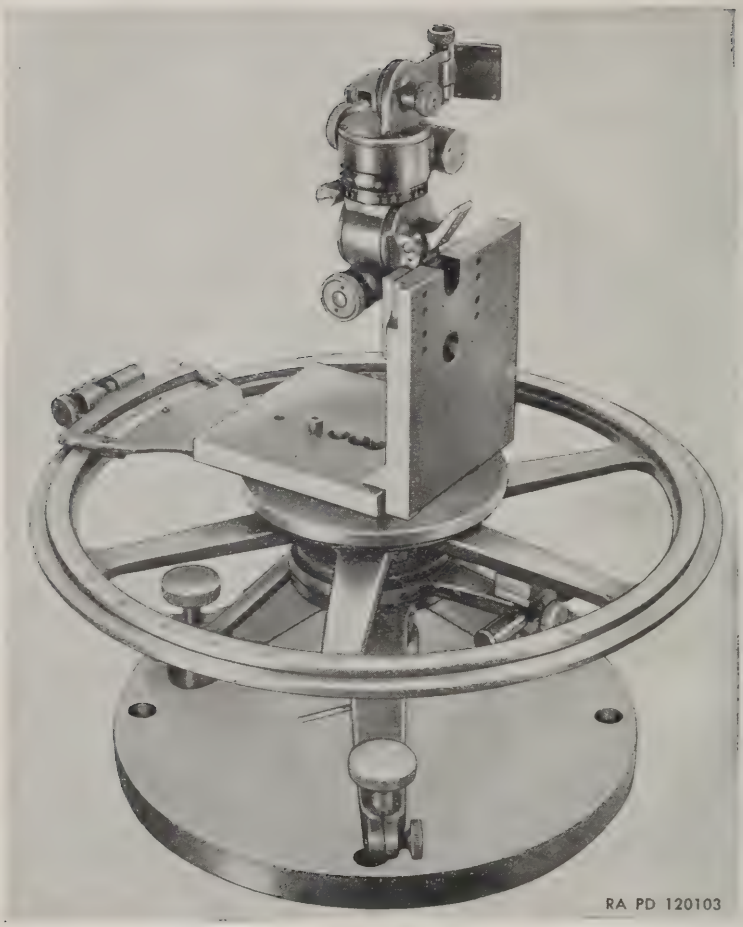

Figure 56. Sight M6 mounted for accuracy test of azimuth mechanism.

CHAPTER 6
FINAL INSPECTION

66. General

Final inspection is performed after repair and rebuild has been completed to insure that the matériel is serviceable according to established serviceability standards.

67. Return to User

If the sights M4 and M6 meet all the requirements as specified in paragraphs 19 to 23 (incl), it is acceptable and may be returned to the user.

68. Return to User or to Stock

If the sight M4 or M6 has been rebuilt in accordance with chapter 5, section IV as well as meeting the requirements as specified in paragraphs 19 to 23 (incl) it may be returned to stock if the user has received another instrument.

APPENDIX
REFERENCES

1. Publication Indexes

The following publication indexes and lists of current issue should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to matériel covered in this manual:

Index of Administrative Publications	SR 310–20–5
Index of Army Motion Pictures, Kinescope Recordings, and Film Strips.	SR 110–1–1
Index of Training Publications	SR 310–20–3
Index of Blank Forms and Army Personnel Classification Tests.	SR 310–20–6
Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.	SR 310–20–4
Introduction and Index (supply catalogs)	ORD 1
Military Training Aids	FM 21–8
Ordnance Major Items and Major Combinations and Pertinent Publications.	SB 9–1

2. Supply Catalogs

The following Department of the Army Supply Catalogs pertain to this matériel:

a. Armament and Related Fire Control Equipment.

Light, Aiming Post, M14, M41 and M43; Light, Instrument, M1, M2, M10, M12, M13, M18, M19, M20, M22, M28, M30, M31, M32, M33, M34, M35, M36 (T10), M37, M38, M39C, M42(T16), M45, M46, M47, and M48.	ORD (*) SNL F–205
Mortar, 60-mm, M2, T18E6, and M19; Mount, Mortar, 60-mm, M5.	ORD (*) SNL A–45
Mortar, 81-mm, M1 and T27; Mount, Mortar, 81-mm, M1, M4, and T21.	ORD (*) SNL A–33
Sight, M4, M6, and M32B1	ORD (*) SNL F–148

* See ORD 1, for published catalogs of the ordnance section of the Department of the Army Supply Catalog.

b. Repair and Rebuild.

Cleaners, Preservatives, Lubricants, Recoil Fluids, Special Oils, and Related Maintenance Materials.	ORD 3 SNL K–1
Common Tools and Equipment (except Machine Tools).	ORD 3 SNL J–17
Tool Set, Fire Control Repairman	ORD 6 SNL J–10, Sec 13
Tool Set, Instrument Repairman (MOS 3922).	ORD 6 SNL J–10, Sec 14
Tool Sets for Maintenance of Sighting and Fire Control Equipment.	ORD 6 SNL F–272

3. Forms

The following forms pertain to this matériel:

WD AGO Form 9–71, Locator and Inventory Control card
WD AGO Form 9–72, Ordnance Stock Record Card
DA Form 9–76, Request for Work Order
WD AGO Form 9–77, Job Order Register
WD AGO Form 9–78, Job Order
DA Form 9–79, Parts Requisition
DA AGO Form 9–80, Job Order File
DA AGO Form 9–81, Exchange Part or Unit Identification Tag
DA AGO Form 446, Property Issue Slip
DA AGO Form 447, Property Turn-in Slip
DA Form 468, Unsatisfactory Equipment Report
DA Form 811, Work Request and Job Order
DA Form 811–1, Work Request and Hand Receipt
DA Form 828, Job Time Ticket—Individual
WD AGO Form 829, Rejection Memorandum
WD AGO Form 865, Work Order
WD AGO Form 866, Consolidation of Parts
WD AGO Form 867, Status of Modification Work Order
DA AGO Form R–5705, Inspection Report
DD Form 6, Report of Damaged or Improper Shipment

4. Other Publications

The following explanatory publications contain information pertinent to this matériel and associated equipment:

a. Decontamination.

Decontamination	TM 3–220
Defense Against Chemical Attack	FM 21–40

b. General.

60-mm Mortar M2	FM 23–85
81-mm Mortar M1 and M29	FM 23–90
81-mm Mortar Mounted in Half-Track Carrier	FM 23–91
Artillery Matériel and Associated Equipment	TM 9–2300
Auxiliary Sighting and Fire Control Equipment	TM 9–575
Inspection of Ordnance Matériel in the Hands of Troops.	TM 9–1100
Reports of Accident Experience	SR 385–10–40
Supplies and Equipment: Unsatisfactory Equipment Report.	SR 700–45–5

c. Repair and Rebuild.

Abrasives, Cleaning, Preserving, Sealing, Adhesive, and Related Materials Issued for Ordnance Matériel.	TM 9–850
Black Finishing Equipment for Ferrous Metals	TM 9–1861
Fire Control Matériel: Lubrication	TB 9–2835–1
Hand, Measuring, and Power Tools	TM 10–590
Instruction Guide: Elementary Optics and Applications to Fire Control Instruments.	TM 9–2601
Instruction Guide: Instrument Repairman	TM 9–2602
Lubrication	TM 9–2835
Maintenance and Care of Hand Tools	TM 9–867
Maintenance of Supplies and Equipment: Maintenance Responsibilities and Shop Operation.	AR 750–5
Modification of Ordnance Matériel	SB 9–38
Operation and Maintenance of Optical Coating Equipment.	TM 9–1501
Ordnance Maintenance and General Supply in the Field.	FM 9–10
Painting Instructions for Field Use	TM 9–2851
Processing of Motor Vehicles and Related Unboxed Material for Shipment and Storage.	SB 9–4

d. Shipment and Stand-by or Long-term Storage.

Army Shipping Document	TM 38–705
Instruction Guide: Ordnance Packaging and Shipping (Posts, Camps, and Stations).	TM 9–2854
Marking and Packing of Supplies and Equipment: Marking of Oversea Supply.	SR 746–30–5
Military Standard—Marking of Shipments	MIL STD–129*
Ordnance Storage and Shipment Chart—Group F.	SB 9–OSSC–F

* Copies may be obtained from Aberdeen Proving Ground, Aberdeen, Md.

Preservation, Packaging, and Packing of Military Supplies and Equipment.	TM 38–230
Protection of Ordnance General Supplies in Open Storage.	TB ORD 379
Shipment of Supplies and Equipment: Report of Damaged and Improper Shipment.	SR 745–45–5
Standards for Oversea Shipment and Domestic Issue of Ordnance Matériel Other than Ammunition and Army Aircraft.	TB ORD 385

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☆ U. S. GOVERNMENT PRINTING OFFICE: 1952—200625

TM 9-1535-3